

# SUPPLEMENT.

# The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

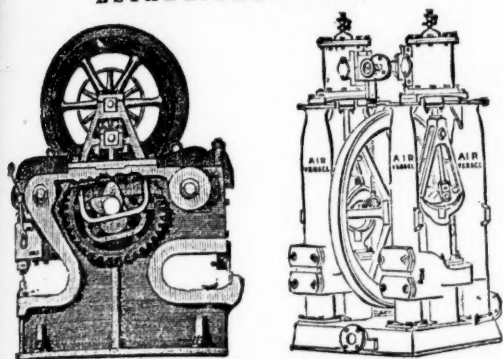
[The MINING JOURNAL is Registered at the General Post Office as a Newspaper, and for Transmission Abroad.]

No. 2184.—VOL. XLVII.

LONDON, SATURDAY, JUNE 30, 1877.

PRICE (WITH THE JOURNAL) SIXPENCE.  
PER ANNUM, BY POST, £1 4s.

**JOHN CAMERON'S**  
SPECIALITIES ARE ALL SIZES OF  
**Steam Pumps, Shipbuilders' Tools,  
BAR SHEARS.**  
ESTABLISHED 1852.



**OLDFIELD ROAD IRON WORKS,  
SALFORD, MANCHESTER.**

For Excellence  
and Practical Success  
of Engines



Represented by  
Model exhibited by  
this Firm.

**HARVEY AND CO.**  
ENGINEERS AND GENERAL MERCHANTS,  
HAYLE, CORNWALL,  
LONDON OFFICE,—186, GRESHAM HOUSE, E.C.

MANUFACTURERS OF  
PUMPING and other LAND ENGINES and MARINE STEAM ENGINES  
of the largest and most approved kinds in use, SUGAR MACHINERY,  
MILLWORK, MINING MACHINERY, AND MACHINERY IN GENERAL.  
SHIPBUILDERS IN WOOD AND IRON.

MANUFACTURERS OF  
**HUSBAND'S PATENT PNEUMATIC STAMPS.**

**SECONDHAND MINING MACHINERY FOR SALE.**  
In Good Condition, at MODERATE PRICES—viz.,

PUMPING ENGINES; WINDING ENGINES; STAMPING ENGINES;  
STEAM CAPTAINS; ORE CRUSHERS; BOILERS and PITWORK of  
various sizes and descriptions; and all kinds of MATERIALS required for  
MINING PURPOSES.

**LYON & DAVISON,**  
IRONFOUNDERS, ENGINEERS, &C.,  
Haydon Bridge, near NEWCASTLE-ON-TYNE,  
Manufacturers of

LEAD SMELTING, REDUCING, AND REFINING FURNACES,  
SLAG HEARTHES, AND SMELTERS' WORK GEAR.  
Plans and Estimates furnished for improved Lead or Copper Mining and  
Smelting Plant.

**ST. LAWRENCE ROPE WORKS,**  
NEWCASTLE-ON-TYNE. Established 1782.

**THOMAS AND WILLIAM SMITH,**  
Manufacturers of all kinds of Iron; Steel, Copper, and Galvanised Wire Ropes;  
Hemp and Manila Ropes, &c.; Round and Flat Shaft Ropes; Crab Ropes; Guide  
Ropes; Hoisting Ropes; and Galvanised Signal Strand; Ship's Standing Rigging  
fitted complete; Patent Hemp and Manila Hawseers, Warps, Cordage, Spun-yarn,  
&c., &c.; Manila Yarn for Telegraph Cables, and Flat Hemp Ropes for Driving  
Rods; Steel Plough Ropes; Fencing Wire and Stand Lightning Conductors, &c.  
OFFICES—  
1, QUEEN STREET, NEWCASTLE-ON-TYNE; DOCK YARD, NORTH  
SHIELDS; 17, PHILPOT LANE, LONDON, E.C.  
STORES—North Shields, Blackwall, Newcastle, and Tyne Dock.

**STANDARD LUBRICATING OILS  
COMPANY, LIMITED.**

DARK and PALE OILS for MACHINERY, RAILWAY, and MINING  
PURPOSES, from TWO SHILLINGS per gallon, and upwards.

AGENTS WANTED.  
95, CANNON STREET, LONDON, E.C.

**ALEX. CHAPLIN AND CO.,**  
CRANSTONHILL ENGINE WORKS, GLASGOW.

PATENTERS AND SOLE MANUFACTURERS OF  
CHAPLINS' PATENT STEAM CRANES, HOISTS,  
LOCOMOTIVES, AND OTHER ENGINES AND BOILERS.

LONDON HOUSE:—  
MCKENDRICK, BALL, AND CO.,  
42, QUEEN VICTORIA STREET, LONDON, E.C.



**A DIPLOMA—HIGHEST OF ALL AWARDS—**given by the  
Geographical Congress, Paris, 1875—M. Favre, Contractor, having  
exhibited the McKeane Drill alone as the MODEL BORING MACHINE  
for the ST. GOTHARD TUNNEL.

**SILVER MEDAL** of the Highland and West of Scotland  
Agricultural Society, 1875—HIGHEST AWARD.

At the south end of the St. Gothard Tunnel, where

## THE MCKEAN ROCK DRILLS

Are exclusively used, the advances made during eight consecu-  
tive weeks, ending February 7, was 24-90, 27-60, 24-80, 26-10,  
28-30, 27-10, 28-40, 28-70 metres. Total advance of south head-  
ing during January was 121-30 metres, or 133 yards.

In a series of comparative trials made at the St. Gothard Tun-  
nel, the McKeane Rock Drill continued to work until the pres-  
sure was reduced to one-half atmosphere ( $7\frac{1}{2}$  lbs.), showing  
almost the entire motive force to be available for the blow  
against the rock—a result of itself indicating many advantages.

The GREAT WESTERN RAILWAY has adopted these  
Machines for the SEVERN TUNNEL; the LONDON AND  
NORTH-WESTERN RAILWAY for the FESTINIOG TUN-  
NEL; and the BRITISH GOVERNMENT for several Public  
Works. A considerable number of Mining Companies are now  
using them. Shafts and Galleries are driven at from three to  
six times the speed of hand labour, according to the size and  
number of machines employed, and with important saving in  
cost. The ratio of advantage over hand labour is greatest  
where the rock is hardest.

These Machines possess many advantages, which give them  
a value unapproached by any other system of Boring Machine.

THE MCKEAN ROCK DRILL IS ATTAINING GENERAL  
USE THROUGHOUT THE WORLD FOR MINING, TUN-  
NELLING, QUARRYING, AND SUB-MARINE BORING.

The MCKEAN ROCK DRILLS are the most powerful—the  
most portable—the most durable—the most compact—of the  
best mechanical devices. They contain the fewest parts—have  
no weak parts—act without SHOCK upon any of the operat-  
ing parts—work with a lower pressure than any other Rock  
Drill—may be worked at a higher pressure than any other  
—may be run with safety to FIFTEEN HUNDRED STROKES  
PER MINUTE—do not require a mechanic to work them—are  
the smallest, shortest, and lightest of all machines—will give  
the longest feed without change of tool—work with long or  
short stroke at pleasure of operator.

The SAME Machine may be used for sinking, drifting, or  
open work. Their working parts are best protected against  
grit and accidents. The various methods of mounting them  
are the most efficient.

**N.B.**—Correspondents should state particulars as to  
character of work in hand in writing us for information,  
on receipt of which a special definite answer, with  
reference to our full illustrated catalogue, will be sent.

PORTABLE BOILERS, AIR COMPRESSORS, BORING STEEL,  
IRON, AND FLEXIBLE TUBING.

The McKeane Drill may be seen in operation daily in London.

**MCKEAN AND CO.**  
ENGINEERS.

OFFICES,  
42 BOROUGH ROAD, LONDON, S.E.; and  
5, RUE SCRIBE, PARIS.

MANUFACTURED FOR MCKEAN AND CO. BY  
MESSRS. P. AND W. MACLELLAN, "CLUTHA IRONWORKS,"  
GLASGOW.

## The Warsop Rock Drill

(Involving an entirely new principle in Mechanical Boring)

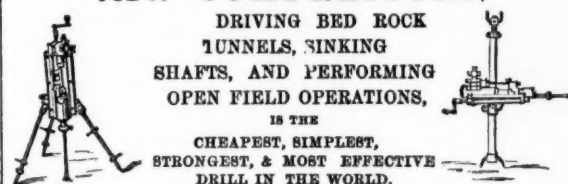
Requires only 20 lbs. steam or air-pressure.  
Has only two moving parts—thus ensuring freedom from de-  
rangement, and is absolutely self-feeding.  
Is excessively light, and can be carried by one man, who can  
with the No. 1 size (weighing only 35 lbs.) drill 40 holes  
 $\frac{1}{2}$  in. diameter and 1  $\frac{1}{2}$  in. deep per minute, in the hardest Aber-  
deen granite for splitting purposes.

**WARSOP AND HILL,**  
HYDRAULIC AND GENERAL ENGINEERS.  
NOTTINGHAM.

STEAM and HYDRAULIC WINDING and PUMPING ENGINES  
of all kinds.

## DUNN'S ROCK DRILL,

AND  
AIR COMPRESSORS.



DRIVING BED ROCK  
TUNNELS, SINKING  
SHAFTS, AND PERFORMING  
OPEN FIELD OPERATIONS,  
IS THE  
CHEAPEST, SIMPLEST,  
STRONGEST, & MOST EFFECTIVE  
DRILL IN THE WORLD.  
OFFICE,—193, GOSWELL ROAD  
(W. W. DUNN AND CO.),  
LONDON, E.C.

## PATENT SELF-ACTING MINERAL DRESSING MACHINE COMPANY

(LIMITED).

T. CURRIE GREGORY, C.E., F.G.S.

OFFICES,—GLASGOW: 4, WEST REGENT STREET.  
LONDON: 52, QUEEN VICTORIA STREET, E.C.

IMPORTANT NOTICE TO MINE PROPRIETORS.

**MR. GEORGE GREEN, ENGINEER, ABERYSTWITTH.**  
SUPPLIES MACHINES under the above Company's Patents for  
DRESSING all METALLIC ORES. Dressing-floors having these Machines pos-  
sess the following advantages:—

- 1.—THEY ARE CHEAPER THAN ANY OTHER KIND IN FIRST OUTLAY.
- 2.—ONLY ABOUT ONE-FOURTH OF THE SPACE USUALLY OCCUPIED  
BY DRESSING-FLOORS IS REQUIRED.
- 3.—FROM 60 TO 70 PER CENT. OF THE LABOUR IN DRESSING, AND  
FROM 5 TO 10 PER CENT. OF ORE OTHERWISE LOST, IS SAVED.
- 4.—THEY ARE THE ONLY MACHINES THAT MAKE THE ORE CLEAN  
FOR MARKET AT ONE OPERATION.

They have been supplied to some of the principal mines in the United Kingdom  
and abroad—viz.,

The Greenside Mines, Patterdale, Cumberland; London Lead Company's Mines  
Darlington, Colberry, Nanthead, and Bollyhope; the Stonecroft and Greyside  
Mines, Hexham, Northumberland; Wanlockhead Mines, Abington, Scotland (the  
Duke of Buccleuch's); Bewick Partners, Haydon Bridge; the Old Darren, Esgr-  
mwyn, and Tatumen Mines, in Cardiganshire; Mr. Beaumont's W.B. Mines,  
Darlington; also Mr. Sewell, for Argentiferous Copper Mines, Peru; the Bra-  
berg Copper Mines, Norway, and Mines in Italy, Germany, United States of  
America, and Australia, from all of whom certificates of the complete efficiency of  
the system can be had.

**WASTE HEAPS**, consisting of refuse chads and skimpings of a  
former washing, containing a mixture of lead, blende, and sulphur,  
DRESSED TO A PROFIT.

**MR. BAINBRIDGE, C.E.**, of the London Company's Mines, Middleton-  
in-Teesdale, by Darlington, writing on the 20th March, 1876, says—"The yearly  
profit on our Nanthead waste heaps amounted last year to £800, besides the ma-  
chinery being occupied for some months in dressing ore-stuff from the mines. Of  
course, if it had been wholly engaged in dressing wastes our returns would have  
been greater; but it is giving us every satisfaction, and bringing the waste heaps  
into profitable use, which would otherwise remain dormant."

**MR. T. B. STEWART**, Manager of the Duke of Buccleuch's Mines,  
Wanlockhead, Abington, N.B., writing on 20th March, 1876, says—"I have much  
pleasure in stating that a full and superior set of your Ore Dressing Machinery has  
been at work at these mines for fully a month, and each day as the moving parts  
become smoother, and those in charge understand the working of the machinery  
better, it gives increasing satisfaction, the ore being dressed more quickly, cheaply,  
and satisfactorily than by any other method."

**MR. BAINBRIDGE**, speaking of machinery supplied Colberry Mines,  
says—"Your machinery saves fully one-half on old wages, and vastly more on the  
wages we have now to pay. Over and above the saving in cost is the saving in ore,  
which is a much short of 10 per cent."

**GREENSIDE MINE COMPANY**, Patterdale, near Penrith, say—"The  
separation which they make is complete."

**MR. MONTAGUE BEALE** says—"It will separate ore, however close  
the mechanical mixture, in such a way as no other machines can do."

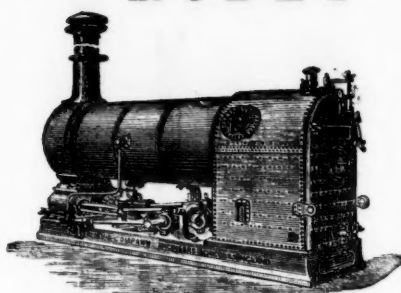
**MR. C. DODSWORTH** says—"It is the very best for the purpose,  
and will do for any kind of metallic ore—the very thing so long needed for dress-  
ing-floors."

Drawings, specifications, and estimates will be forwarded on application to—  
**GEORGE GREEN, M.E., ABERYSTWITTH SOUTH WALES**



# ROBEY & CO., ENGINEERS, LINCOLN,

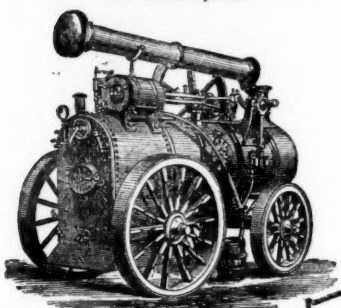
SOLE MANUFACTURERS OF THE



THE PATENT ROBEY FIXED ENGINE AND LOCOMOTIVE BOILER COMBINED, 4 to 50-horse power.

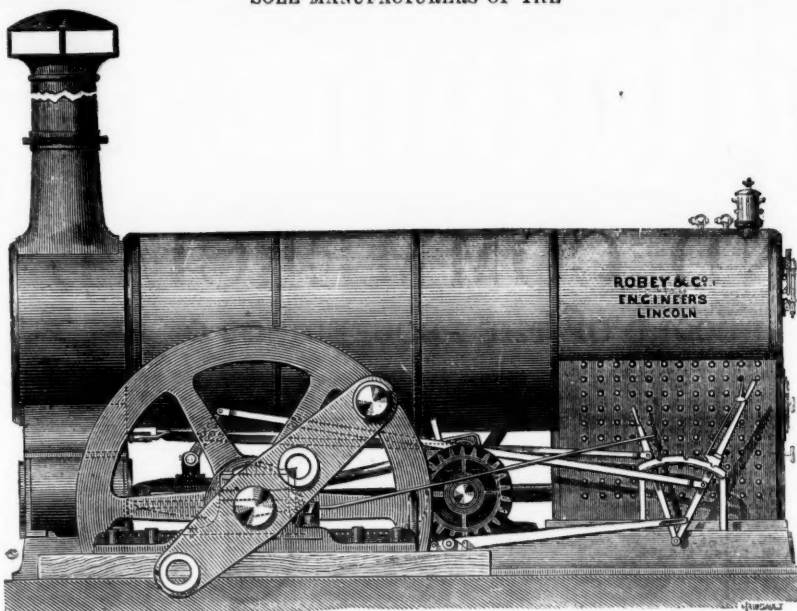


VERTICAL STATIONARY STEAM ENGINE AND PATENT BOILER COMBINED, 2 to 12-horse power.



SUPERIOR PORTABLE ENGINES, 4 to 50-horse power.

No Expensive Brick Buildings or High Chimney required.



## PATENT IMPROVED ROBEY MINING ENGINE,

OF ALL SIZES, FROM 4 TO 50-HORSE POWER.

Some of the advantages of this New Engine are as follows:—

SMALL FIRST COST. SAVING OF TIME AND EXPENSE IN ERECTING. EASE, SAFETY, AND ECONOMY IN WORKING. GREAT SAVING IN FUEL.

This New Engine is free from all the objections that can be urged against using the Semi-Portable Engine for permanent work, because it possesses the rigidity and durability of the Horizontal Engine, and at the same time retains the advantages of the Semi-Portable in saving time and expense in fixing.

## THE PATENT ROBEY FIXED ENGINE

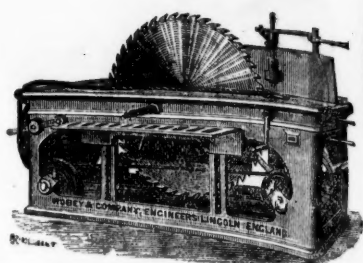
(Also above illustrated) is admirably adapted for driving Rolling Mills, Saw Mills, Brick Machinery, Pumping Machinery, and all descriptions of Fixed Machinery.

ENGINES UP TO 200 EFFECTIVE HORSE-POWER ALWAYS IN PROGRESS.

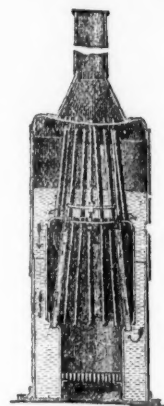
Prices and full particulars of all the Machinery here illustrated on application to the Sole Manufacturers,

**ROBEY & CO., ENGINEERS, LINCOLN, ENGLAND.**

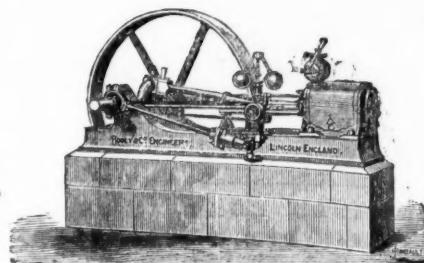
London Office: 117, Cannon Street, London, E.C.



SELF-ACTING CIRCULAR SAW BENCH.



PATENT VERTICAL BOILERS, 2 to 12-horse power.



IMPROVED HORIZONTAL FIXED STEAM ENGINE, 4 to 60-horse power.

## "INGERSOLL ROCK DRILL,"

LE GROS, MAYNE, LEAVER, & CO.

60, Queen Victoria Street, London, E.C.

5, PARK PLACE, NEW YORK, U.S.A.



We claim 40 per cent. greater effective drilling power, and offer to compete with any machine of its class.

See following extracts from the reports of Judges in awarding Medals:—

"2. Its simple construction ensures durability, &c.

"4.—The steam or air cushions at each end of cylinder effectually protect from injury

"5. Its having an automatic feed, giving it a steady motion, &c.

"6. Its greater steadiness and absence of jar and vibration experienced in other drills, which is very destructive to their working parts, &c.

"7. Its greater power is some FORTY PER CENT. in favour of the Ingersoll."

Medals awarded for several years in succession "For the reason that we adjudge it so important in its use and complete in its construction as to supplant every article previously used for accomplishing the same purpose."

Estimates given for Air Compressors and all kinds of Mining Machinery. Send for Illustrated Catalogues, Price Lists, Testimonials, &c., as above.

JOHN AND EDWIN WRIGHT,

PATENTERS.

(ESTABLISHED 1770.)

MANUFACTURERS OF EVERY DESCRIPTION OF IMPROVED

PATENT FLAT AND ROUND WIRE ROPE

from the very best quality of charcoal iron and steel wire.

PATENT FLAT AND ROUND HEMP ROPES,

SHIPS' RIGGING, SIGNAL AND FENCING STRAND, LIGHTNING CONDUCTORS, STEAM PLOUGH ROPES (made from Webster and Horsfall's patent steel wire), HEMP, FLAX, ENGINE YARN, COTTON WASTE, TARPULING, OIL SHEETS, BRATTICE CLOTHS, &c.

UNIVERSE WORKS, MILLWALL, POPLAR, LONDON.

UNIVERSE WORKS, GARRISON STREET, BIRMINGHAM.

CITY OFFICE, No. 5, LEADENHALL STREET, LONDON, E.

## Archer's New Patent Stone Breakers.

Sole Makers: **DUNSTON ENGINE WORKS CO., GATESHEAD-UPON-TYNE, ENGLAND.**

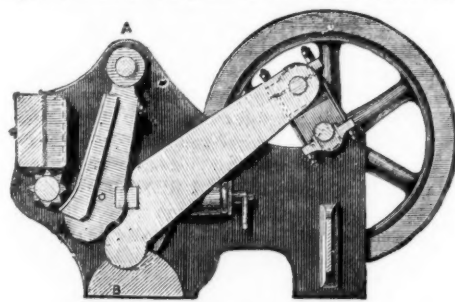
### STONE BREAKER,

For Road Metal, &c.

Machines with combined Vertical Jaw and CUBING ROLLER.

Guaranteed to break more cubical and to make less small than any other Machine.

Simple Machines, with plain Vertical Jaws, without Roller.



MACHINES can be SEEN at WORK at AGRICULTURAL SHOW to be HELD at BATH, JUNE 4, 5, 6, 7, and 8. SHED No. 3—STAND No. 88.

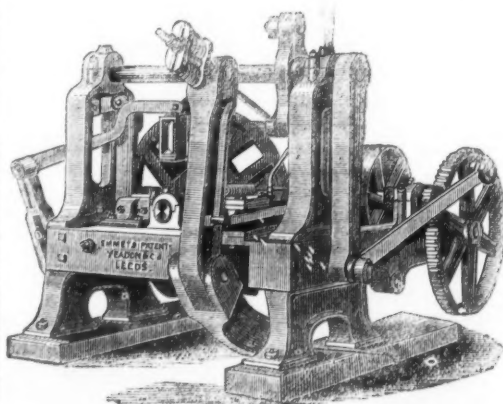
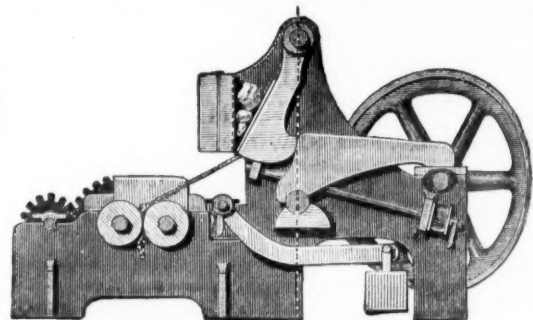
ARCHER'S PATENT BONE MILL—Sole Manufacturers.

MANUFACTURERS OF MARINE AND STATIONARY ENGINES; AND COLLIERY MACHINERY, CAGES, TUBS, &c., and every description of MACHINERY USED IN CHEMICAL WORKS.

### PULVERISER,

For Crushing and Pulverising Rocks, Ores, Emery Stone, &c., &c.

Apply for prices and particulars to the Manufacturers, as above.



## A1 PATENT BRICK MACHINE.

Massive; durable; cheap; takes little power, and gives PERFECT SATISFACTION.

This is the ONLY Machine which presses the Brick equally on BOTH sides, each plunger entering the mould plate  $\frac{3}{4}$  in., and turning out 12,000 SQUARE, SOLID, PRESSED Bricks per day. READY AT ONCE FOR THE KILN.

SOLE MAKERS—

**YEADON AND CO.,**

CROWN POINT FOUNDRY, LEEDS.

Makers of EVERY DESCRIPTION of Colliery and Brick Yard Plant.

LONDON AGENTS—

HAUGHTON AND CO., No. 122, CANNON STREET, E.C.

CONTINENTAL AGENTS—

PLAMBECK AND DARKIN, 171, QUEEN VICTORIA ST. E.C.



# THE IRON INDUSTRIES OF DEVONSHIRE.

By RICHARD MEADE, Assistant Keeper of Mining Records,  
Museum of Practical Geology.

Ferrous deposits are more or less diffused through the formations of every geological age, the richest varieties occurring in the older rocks. In this country the most important deposits of red hematite are found in the hollows of the carboniferous limestone in Devonshire, Cumberland, and other places, yielding from 60 to 66 per cent. of metallic iron. The other principal sources of supply being the argillaceous carbonates obtained from the ironstone measures of the coal fields, which, with the varieties obtained from the liassic and oolitic strata, furnishes by far the greatest proportion of the iron-ore smelted in the blast-furnaces of Great Britain.

Spathic ores occur in a few localities in this country, the principal ones being in the Brendon Hills (in Somersetshire), Weardale (in Durham), and a few other localities in Cornwall and Devonshire. This last-named county, the subject of the present notice, though producing iron ore in considerable quantities compared with the rest of the Kingdom, yet the quality and character of the ores there wrought demand them to the attention of the ironmaster, occasioning a good command when the iron trade is active.

The production of the iron mines of Devonshire in the year 1837 did not exceed 10,000 tons, those of Cornwall in the same year being estimated by a competent authority at 30,000 tons, the varieties being brown hematite, magnetic, and spathose ores. At an early period iron ore (magnetic oxide) was wrought at Haytor, near Ilminster; at Henock, a micaceous variety, in lodes varying from 1 to 12 ft. wide, bearing east and west, and occurring in a close-grained porphyritic granite, the ore being associated with quartz, schorl, clay, and hornblende, and a brown iron ore at Bishopstington, occurring in the limestone in irregular masses, also at Brixham, the ore yielding from 55 to 60 per cent. of metallic iron.

The occurrence of iron ore at Haytor has long been known; nearly half-a-century since Mr. T. J. Kingston, of Ilminster, Devon, published a very interesting account of this deposit in the Philosophical Magazine. At that time the lode as far as explored exhibited much regularity, and is thus described:—"The lode occurs in the clay-slate, and the direction of its strata is nearly north-west and south-east, underlying to the north-east at an angle of 22° or 23° only for the first few feet from the surface, but below this the dip is very regular, at an angle of 45°, the lode having a width of 28 feet, of which 16 feet was iron ore." From some experiments made it appears that ore when smelted yielded iron of a tough and superior description, and was then used in admixture with the argillaceous ironstone of the coal measures of South Wales. The Haytor ore at the period previously referred to was favourably regarded for the manufacture of steel, the average yield of the ore being about 50 per cent. of metallic iron.

At Smallacombe, near Ilminster, in the clay slate or killas, which is traversed by masses of greenstone (dolerite), highly ferruginous and much decomposed near the surface, ores of iron of two varieties occur—the one brown hematite or limonite, the other magnetite. Mr. J. H. Collins, F.G.S., thus describes the deposits of iron ore at Smallacombe:—"The limonite occurs in nodules, forming irregular beds in a thick mass of variegated sands and clays, the innumerable layers of which slope gently a few degrees only from the horizontal to the south-east. The magnetite forms three or four beds of variable thickness, occurring in a thick mass of greenstone, which cuts the killas under and west of the beds of limonite. The general dip of the greenstone and its enclosed bed seems to be about 30° from the horizontal, and its strikes nearly north. The limonite beds have a strike considerably west of north, so that the two series of deposits come together near the north of the estate."

At Smallacombe the beds of hematite are wrought in open workings, from which an adit has been driven obliquely through them a distance of 90 fms. northward and westward, with the object of reaching the beds of magnetite existing at a greater depth under the hill. As far as can be ascertained, the following are the quantities of iron ore raised and sold from Smallacombe in each of the years named:—

Year.	Tons.	Year.	Tons.
1855	2176	1871	352
1856	1875	1872	1775
1857	73	1873	1272
1858	507	1874	2069

For other years the returns of production of ore are not separately distinguished, though produced in some quantities. An examination of the ore raised at Smallacombe made by Mr. Child, of Dowlais, shows the following constituents:—

Sesquioxide of iron...	41.96
Oxygen...	17.98
Iron as carbonate...	8.48
Carbonic acid...	9.09
Alumina...	1.20
Lime...	1.70
Silica...	10.15
Phosphoric acid...	nil
Sulphur...	trace
Magnesia...	trace
Moisture...	4.83
Combined water...	5.49 = 100.88

The equivalent of metallic iron amounting to 50.44 per cent. Hematite iron ore is wrought at Torbay, between Torquay and Dartmouth, occurring in the Devonian limestone, which is tilted at a considerable angle, and broken asunder near the surface; in the fissures formed by the tilting of the rock reposes the deposit of iron ore, a large proportion being a hard brown and massive hematite, also including some kidney ore. The fissure containing the ore has a direction east and west, and is said to extend to a distance of 800 yards from the sea coast, where the lode at the top of the cliff shows a width of nearly 80 yards, and somewhat less below. The production of the Torbay Mines has been as follows, since the year 1870, of brown hematite:—

Year.	Tons.	Year.	Tons.
1870	1,000	1873	No return
1871	3,000	1874	3,419
1872	13,000	1875	300

The value of the ore in the last named year was 15s. per ton. The Brixham Mines of brown hematite raised as follows:—

Year.	Tons.	Year.	Tons.
1856	3700	1868	3563
1857	2000	1869	6092
1858	1400	1870	6100
1859	2270	1871	8772
1860	2400	1872	1593
1861	5257	1873	600
1862	3550	1874	2166
1863	97.8	1875	907

The mines at Brixham include the workings at Sharkham Point, Five Acres, and Charter. At the Upton Mine, near Brixham, 2553 tons of brown hematite, of the value of 1914s., was raised in the year 1875, giving an average value per ton of 15s. For a few years individual returns of some of the above named workings are recorded showing occasional interruptions in the mining operations, due, probably, to inactivity of the iron trade and want of demand.

The Torbay hematite has been subjected to analysis—one here given, made by Dr. Noad, F.R.S., includes an examination of the ore in powder, and a second of the ore in lumps; the first named being in fine (moist) powder, which was carefully dried. The following show the constituents:—

	Ore in powder.	Ore in lumps.
Peroxide of iron...	63.42	60.00
Oxide of manganese...	0.24	0.30
Lime...	0.60	0.42
Phosphoric acid...	0.28	0.38
Insoluble sand...	35.20	8.60
Total...	99.74	99.70

The yield of metallic iron in the powdered ore was equivalent to 44.56 per cent., that of the ore in lumps 63 per cent. In reference to the above analyses, Dr. Noad further remarks that the powder in the first is siliceous in character and not particularly rich in iron; while the second analysis, of ore in lumps, constitutes by far the largest bulk of the sample, to the extent of seven-eighths is rich and valuable, being materially enhanced by the absence of sulphur, and the small percentage of phosphoric acid.

The Torbay Hematite Iron Company, working the Brixham and Torbay Mines, submitted in 1872 specimens of the ore raised to

Prof. Odling, F.R.S., for examination, the following show the results of two varieties:—

	First.	Second.
Peroxide of iron...	69.10	69.58
Siliceous matter...	4.15	14.38
Sulphur...	12	15
Phosphorus...	trace	10
Water...	14	14.39
Organic matter...	40	1.40
Total...	100.00	100.00

The peroxide in the first analysis is equivalent to 66.57 per cent. of metallic iron; that of the second, 48.70 per cent.

Of the iron ores raised from the mines of Brixham one kind—a brilliant micaceous hematite of a soft variety—is prepared and ground in a mill with linseed oil into paint, which is largely employed in coating ironwork, and is commercially known as "Torbay paint."

The ore used in this preparation exhibits the following constituents:—

Sesquioxide of iron...	89.34
Protoxide of manganese...	0.33
Alumina...	0.33
Lime...	0.33
Magnesia...	0.20
Phosphoric acid...	0.13
Sulphuric acid...	trace
Bisulphide of iron...	trace
Water combined...	8.83
Ignited insoluble residue...	1.70 = 101.19

These Torbay paints are advantageously used in preventing and arresting rust, preserving the iron from the corrosive influence of impure water and gaseous exhalations, and are used by gas and railway companies and several departments of the Government.

It would have been interesting to have followed in detail the produce of individual mines from year to year; this, however, has not been practicable, as in some years the returns of certain mines are grouped together. The following, however, are given to show what has been done in some of the iron mines at various periods in the years named:—

Mines.	Year.	Quantities—Tons.
Comb Martin	1855	1,190
ditto	1856	400
Prawle Point	1858	300
Haytor and Ilminster	1858	3,000
ditto	1859	3,598
ditto	1860	1,456
Atlas	1860	1,300
Hatherley	1867	500
Yealmton	1867	250
Five Acres	1868	3,958
Sharkham	1868	3,425
Parker's Mine	1870	500
ditto	1871	1,000
Shaugh	1870	1,307
ditto	1871	1,581
ditto	1872	807
Stoke Gabriel	1865	4,000
Bradsands	1872	3,906
Bampfylde	1873	1,800
Hook Hill	1870	896
Brixham Mining Company	1865	13,505
ditto	1866	17,472
Brixham Hematite Company	1866	3,204
ditto	1867	2,332
ditto	1868	5,762
West Brixham	1872	400
South Devon	1872	380
ditto	1873	476

Brown iron ore also occurs at Henock, near Chudleigh, in an east and west lode, and has been worked at intervals over a distance of nearly two miles, and to the depth of from 20 to 30 ft., and is said to have gone down very rich, the ore being of a micaceous character, yielding 55 per cent. of metallic iron—the lode nearly vertical, and about 4 ft. wide, and worked by two adits driven on the lode from the bottom of the hill. In 1872, from a return for that year, there appears to have been 181 tons of ore raised from Henock workings. Near Buckfastleigh, at the South Devon Mine, occurs lodes of iron ore, coursing east and west, and yielding ore of good quality, the lodes being embedded in killas and limestone. The ore raised from these workings for the years 1872 and 1873 appear in the above abstract; in 1874 there was raised 255 tons of brown hematite of a micaceous character, and giving 55 per cent. of metallic iron.

In North Devon and West Somerset, in that hilly tract of country extending from Ilfracombe on the west, to near Bridgewater on the east, considerable explorations have been made in the iron ore deposits of that district, which may be said to extend some 30 miles in length, by about 5 miles in width. Within this area at intervals various iron mines have been from time to time opened. Mr. W. W. Smyth, F.R.S., in a paper on the iron ores of the district, here referred to, thus describes the area—"If from Linton, where the lower beds of the range may be examined, the observer travels southward, he will pass over a constantly ascending series of strata, and about Simon's Heath, on Exmoor, will reach the line of irregular lenticular deposits of limestone, which, trending from Coombe Martin by Challacombe, through the midst of Exmoor to Catcombe and Treborough, furnishes an indication of the general strike of the district, and a supposed parallel to the more massive limestones of Plymouth."

The ores of iron in Exmoor occur both in regular strata and veins, and it is evident from various circumstances that they were known and worked at an early period. The ores occurring in strata have been found on the flank of the Hangman Hill, near Coombe Martin, in the valley of the Exe, north-east of Simonsbath, and in the North Forest Exmoor, in nodules generally of small size, and often tilted with the shales in which they occur at such considerable angles as to render their working difficult. An uncommon variety of chocolate or claret-coloured ore, with an unusually high percentage of iron, is seen in the North Forest of Exmoor. The lodes or iron-bearing veins of this district appear to have a direction running east 10° south, inclining at an angle of from 45° to 65° southward. Returns of production of deposits wrought in Exmoor are wanting; the ore of some of the veins have, however, been examined by Mr. E. Riley, the first from the Roman lode, Cornham Farm, exhibiting small crystals of specular iron, but with a structure through the mass distinctly resembling that of sparry iron (carbonate). The second analysis refers to ore occurring in Rogers' lodes, some mile distant, and south of Simonsbath, in the Deer Park, consisting of brown or hydrous peroxide of iron, in a state of great purity, as evidenced by the millions of little prismatic crystals of "goethite" lining the interior of numerous cavernous hollows, which are interspersed amidst a mass, bearing evidently the general rhombohedral structure of sparry iron:—

	First.	Second.
Peroxide of iron...	98.41	71.34
Peroxide of manganese...	0.29	16.79
Oxide of manganese...	1.01	1.49
Silica...	0.16	0.22
Magnesia...	0.12	0.33
Phosphoric acid...	—	1.10
Alumina...	—	0.13
Lime...	—	0.79
Moisture...	0.13	—
Combined water...	0.04	0.05
Oxide of copper...	—	0.19
Oxide of nickel and cobalt...	—	—
Total...	100.16	100.41

The workings in Rogers' lode, above referred to, prove it to consist in a width, averaging probably 9 ft., of a loosely agglomerated "goethite," with much the same character throughout, occasionally intermingled with bands of quartz and fragments of the adjoining slate rock. At Hangley Cleave, on the extreme south of the moor, a lode of from 15 to 20 ft. wide occurs, of botryoidal and cavernous brown ore, intermingled with quartz and slate, and is succeeded, at the depth of a few fathoms only, first by single nuclei, and further by masses of a pale colour red and compact sparry ore. Many of the foregoing facts are derived from Mr. W. W. Smyth's paper on the Iron Ores of Exmoor, read before the Geological Society some years since.

The extensive operations carried on in the Brendon Hills, at the Raleigh Cross and other mines, have already been described in the notice of the Somersetshire Iron Industries, which appeared in the Journal of April 15, 1876.

The only other localities in this country in which similar deposits of spathic carbonates of iron occur are those of Weardale, in Durham, in lodes in the carboniferous limestone, associated with lead and zinc ores, and at Perran, in the adjoining county of Cornwall, and of late years these ores have been successfully employed in South Wales and elsewhere in the production of spiegeleisen.

An analysis of the spathic iron ore raised in the Brendon Hills, in Somersetshire, made by Mr. John Spiller, late of the Royal School of Mines, appears in the following:—

Protoxide of iron...	49.84
Protoxide of manganese...	12.64
Peroxide of iron...	0.81
Lime...	0.23
Magnesia...	3.63
Carbonic acid...	35.85 = 100.05

The percentage of metallic iron being equivalent to 34.65, and metallic manganese 9.73. The Weardale ore yielding 38.56 of metallic iron, and of manganese 1.86 per cent.

At the Florence Mine, near North Molton, lodes of hematite are wrought by the Florence Mining Company. The lodes dip at an angle of 62°, and vary from 4 to 13 ft. in thickness, the levels being open on two separate lodes. The ore raised during the past three years was as follows:—

Year.	Tons.	Value.
1873	3000	£2350
1874	4386	3125
1875	1215	911

In North Devon, near Barnstaple, some promising lodes of brown hematite have been recently opened out at Spreecombe and Bratton Fleming, manganese being also wrought in the last-named mine. Other repositories of iron ore occur in the limestone at Sharkham Point, worked to some extent in past years. Again, at Brent magnetic iron ore occurs at Mantish, near the River Avon, in shallow deposits on the mass of greenstone. Other deposits in lodes appear on Brent Hill, but little workings have hitherto been carried on.

The earliest information bearing on the production of iron ore in Devonshire appears to refer to the end of the last century, when between the years 1796 and 1802 iron ore amounting to 9293 tons was shipped from the lode near Coombe Martin to the ironworks at Llanelly, in South Wales.

Since the year 1855 the production of the Devonshire iron mines have been as follows, to which is appended, for comparison, the production of the Cornish and Somersetshire iron ore deposits in each of the same years:—

Year.	Devonshire.	Cornwall.	Somersetshire.
1855	1,500	24,057	25,842
1856	2,000	19,359	29,083
1857	3,598	35,213	32,763
1858	5,399	26,262	32,763
1859	7,014	18,976	34,709
1860	37,814	36,112	37,984
1861	10,212	6,426	36,874
1862	7,104	4,619	27,280
1863	10,193	11,314	19,789
1864	14,124	21,947	32,888
1865	29,361	31,199	30,913
1866	31,455	31,455	46,532
1867	21,313	45,055	41,342
1868	10,594	11,403	45,165

The total production of the iron mines of the United Kingdom in the last named year was 15,821,060 tons, valued at 5,975,410s., to which should be added 280,000 tons of burnt ore obtained from cupreous pyrites, and 458,693 tons of foreign ores, giving an aggregate total of 16,559,753 tons of iron ore of all varieties smelted in the 629 blast-furnaces in operation in the same year.

In the following statement appears the mines of Devonshire raising ore in the years 1874 and 1875, with the quantities obtained therefrom, distinguishing each variety:—

District or mine.	Character of ore.	1874—tons.	1875—tons.
Bampfylde	Spathose	418	22
Brixham	Brown hematite	2168	908
Bulkamore	ditto	1000	3400
Florence	Spathose	4386	1215
Frank Mills	ditto	70	100
Furzeham	Brown hematite	300	—
ditto	ditto	1000	—
Girt Down	ditto	300	—
Haytor Vale	Magnetic	1669	530
Haxon Down	Red hematite	20	—
M-reia	Brown hematite	—	200
Neomie	ditto	—	175
Spreecombe	ditto	378	158
Prosper, Wheal	ditto	603	—
Plaisow	ditto	240	—
Shaugh	ditto	965	—
Shirwell Ford	ditto	5	—
Shirwell & Bratton Fleming	ditto	250	—
Smallacombe	ditto	2069	—
South Devon	ditto	255	—
Torbay	ditto	—	300
Ugborough	ditto	900	1033
Upton and Torbay	ditto	3419	2553
Walborough	ditto	1000	—
Total		21,313	10,594

The value of the ore raised in Devonshire in the year 1874 was 15,258s., and in the year 1875, 7933s., giving an average value of 15s per ton.

DISTRIBUTION OF THE DEVONSHIRE IRON ORES.—Formerly, it appears, furnaces were erected at Bovey Tracey for the reduction of the ores of that district, but all the works have long since been abandoned. The ore is largely exported to South Wales, and some quantities, though inconsiderable, are conveyed to the North of England. In the annexed abstract is given the quantities shipped from the respective ports of Devon in each of the years named, as far as returns are obtainable:—

Year.	FROM BRIXHAM.	Year.	Tons.
1855	33,814	1871	11,000
1856	18,867	1872	15,305
1857	8,829	1873	2,263
1858	3,563	1874	2,166
1870	5,000	1875	1,906

Year.	FROM TEIGNMOUTH.	Year.	Tons.
1858	1329	1869	345
1859	1269	1870	145
1860	1422	1871	301
1861	1742	1872	703
1862	590	1873	230

Year.	FROM DARTMOUTH.	Year.	Tons.
1866	1000	1871	672
1867	250	1872	364

Railway returns show that in 1874 the South Devon Railway carried from the following stations a total of 5678 tons of iron ore:—

From Shaugh Siding	905
Kingsbridge Road	320
Newton	857
Bovey	3355
Buckfastleigh	151
Total	5678

In concluding our notice of the Iron Industries of Devonshire, it may be remarked that the year 1855 was that in which the largest production was recorded, amounting to 37,814 tons, from which date a gradual falling off in the produce of the mines is observable, until 1872 and 1873, when the yield of the mines increased somewhat. They are capable, however, of greatly increased production whenever the demand may arise for iron ores.

RED-LEAD FURNACES.—By the invention of Mr. Wm. Lang, jun., of Glasgow, the lead is prevented from finding its way into the mass of brickwork. The beds of furnaces hitherto adopted being of solid brickwork, the lead has to saturate more or less this brickwork before a working furnace is obtained. Mr. Lang's improvements consists in making an iron sole, preferably in two pieces, of a shape similar to a trapezoid, or four-sided figure, having two of its opposite sides parallel. It is made of cast-iron or wrought-iron, and has flanges on all the sides. The sole rests on butts of brickwork, and the surface is filled in with best fire-bricks to form the bed of the furnace. The other parts of the furnace are similar in construction to the furnaces or ovens at present in general use. The working of the new furnace does not involve any new process. The essential feature of the invention consists in the peculiarity of making the sole of the furnace of a cast-iron plate lined with brickwork, though for the sake of getting a better casting he casts the plate in two pieces, and then joins together with bolts and nuts; the same may be made in one piece, or can be made up of more than two pieces.

WASTE NOT, WANT NOT, would appear to be the motto of the Liverpool Marine Store Company, who are pushing their business for buying up all sorts and quantities of old material of every description of sacking, bagging, and ropes.



## Original Correspondence.

## MINING IN THE EAST—No. XV.

## CONTACT DEPOSITS OF THE BANAT.

**SIR.**—GEOLOGY: The metalliferous deposits found associated with the bosses of eruptive rock in the Banat make their appearance in an ellipsoidal depression of the crystalline schists, which is limited laterally by two parallel chains of hypogene mountains. This basin extends from the ancient silver-lead mines of Cuchania, in Serbia, 70 English miles northwards to Booschan, on the Bersava, with a breadth of from 4 to 12 miles.

The sedimentary formations deposited on the crystalline schists, ranging from the true carboniferous to the eocene, have everywhere been found conformable up to strata recognised as parallel to the gault. At Cuchania the granite is seen rising into elevated masses immediately to the east of the so-called trachyte, and in pursuing the rim of the basin many rounded knolls bear witness to the existence of the granite in a northerly direction until the Danube is approached, when the granite comes to the surface, with a breadth of at least 2 miles near Bersava, and continues with only one interruption to Franzdorf, in a broad belt of dreary undulations, supporting a sparse vegetation, over which lie scattered patches of stunted thorn bushes. To the east mica-schists again appear, but no minerals of value have been found in them. Along the western edge—i.e., next the horizontal miocene strata forming the Hungarian plains—denudation has disclosed at numerous points long ridges of syenitic rocks, extending in a meridional line from Cuchania, where it is in contact with the granite to the River Maros, at Lippa. Between these grassy mounds the eruptive rock is concealed by neocomian limestone towards the south, whilst highly foliated chlorite slates prevail to the north.

The group of strata thus enclosed resemble in appearance and sequence both the sedimentary beds reposing on the western and southern slopes of the Carpathians, and the rocks composing the foothills of the Tura Alps to the west. There can, therefore, be little doubt that, though they have been isolated adventitiously by upheaval and denudation, all these formations were once continuous over the whole of Eastern Europe and Asia Minor. Although in the district under consideration the eruptive rocks have appeared grouped very distinctly in a lineal direction, yet an examination of the whole extent of these formations would assuredly demonstrate the presence of numerous protrusions of granite and syenite, which have penetrated and displaced them.

The geology of these countries is very imperfectly mapped, and the frequency of these occurrences is, therefore, not known; but in ancient as well as in modern times many deposits associated with syenitic rocks have been mined, and yielded enormous quantities of metal.

The granite has approached the surface during upheaval, but was consolidated under a thick series of strata, finally rendered visible by denudation; its junction with other rocks has not been remarkable for mineral wealth, though numerous small deposits have been segregated on and near them. That this upheaval was the work of ages and not paroxysmal may be well observed in following the military road along the Danube from Milanovatz to Moldova, where the entire series from the carboniferous to the chalk appear in regular beds, dipping about 40° towards the south-west. In this part of its course the Danube has cut through these strata, and exposed on each bank tremendous escarpments of limestone, porphyry, sandstones, and slates, which, affording shelter to few trees, allow the eye to follow with facility the lines of stratifications from their dip under the river to a height of more than 2000 feet. To a geologist, ascending the Danube in one of the D.D.G. steamboats, this unbroken parallelism of the strata for such a distance is full of interest; and his pleasure is enhanced by observing the clear separation of the red sandstones and slates by the magnificent basaltic escarpments of the grey limestone, which passing diagonally up the face of the mountains extend in shaggy crags along their crests.

After the partial consolidation of the granite, subordinate eruptions accompanied renewed Plutonic action, and these breaking through the granite crust and crystalline schists penetrated the Jura and Neocomian formations, originating abundant masses of syenitic rocks, whose superior elevations have been exposed in dome-like forms. The heat radiated from these tertiary eruptions during refrigeration under no great thickness of superincumbent strata excited those reactions between the calcareous strata and the syenite, by means of which the varied and rare contact rocks of the Banat and Serbia have been elaborated, and the rich ores of the metals concealed in them. Although the peculiar varieties of the syenite and the diversified results of its action on the sedimentary strata yield evidence conclusive of the proximity of the surface during their formation, yet no eruptive rock has yet been observed that would lead to the supposition of their having actually broken through the superficial crust. On the west of the chain of syenitic elevations lie micaceous schists dipping west, on which rests the Nesgen formation, abutting in horizontal strata against them. These tertiary rocks are so covered with diluvium that it is difficult to get a section.

There is a considerable discrepancy between the deposits associated with the granite to the east and those of the western syenite, for whilst the ores obtained from the latter have been varied and rich the former have given but little proof of mineral wealth, and the contact rocks so conspicuously accompanying the syenite are scarcely represented. It is certainly remarkable that rocks so analogous in structure and composition as granite and syenite bursting through the same strata should have developed metamorphic results of a character so opposite. Can it be partially explained by supposing a thick series of beds to have been superimposed on the granite at the earlier date of its eruption? Whatever the reason, the granites of the Banat and Serbia seem to be unfavourable to the segregation of mineral.

This may be best seen at Cuchania, where the granite and syenite are almost if not quite in contact. Here the syenite—or, as Prof. Szabo prefers to call it, the trachyte—has given birth to rich auriferous silver-lead deposits, extending along the junction of that rock with the Neocomian limestone, whilst the many galleries driven along the junction of the granite with the same calcareous strata have given faint hopes of the existence of any ores there.

The characteristic which marks the whole of the mining districts as peculiar is the total absence of veins or faults in connection with the deposits—no dykes, holes, cross-courses, or flunkans having been encountered in the mines. Therefore these deposits superficial, and the ores instead of filling veins have accumulated at the junctions of rocks which having an origin and character widely separated may be considered as contact faults, and have thus really performed the rôle of lodes.

Before proceeding with the description of the interesting mining tracts a few observations on the sedimentary strata and the eruptive rocks will be expedient to render it intelligible.

## THE CRYSTALLINE SLATES.

Regardless of the scattered eruptions of granite and syenite—which if numerous are never extensive—over the whole of the Banat from Weisskirchen and Booschan eastward to the Wallachian frontier prevail crystalline schists—chlorite slates, hornblende slates, porphyry beds, clay-slates, &c., which rarely shade off into gneiss. Up to the present all these varieties have been included under the generic name of mica-schist, and have always been so coloured on the geological charts. Of this portion of the Austrian Empire, which as the military frontier was until lately closed to mining industry, no detailed map of the strata exists, and, in fact, much that lies under the colour for *Glimmerschiefer* conceals other rocks. On the Serbian side of the Danube the crystalline slates are of a similar character, but evidence a greater tendency to pass into gneiss beds. The clay and mica slates do not appear to have been violently disrupted, but lie on the eastern slope of the granites and on the western slope of the syenites at angles not exceeding 50°; the chlorite slates are much bent and folded, whilst the hornblende slates present almost everywhere a very foliated structure.

These crystalline slates having acquired their metamorphic character through hypogene influences continued during cycles at a vast depth, and not by the direct action of eruptive rocks, seldom

enclose deposits of mineral sufficient to encourage the miner. The eruptive rocks which have broken through them have excited a renewed and more vigorous metamorphism of the contiguous schists. There is, however, a remarkable difference in the metamorphic effect produced by the granite and syenite. The granite often passes gradually into gneiss and mica-schist without any remarkable transformations, whilst the syenite has induced the formation of true crystalline rocks extending a considerable distance on either side.

Many quartz veins or lenticles are everywhere existent, and near the surface may be found carbonates of copper coating—often profusely—the joints, together with spathic iron, sulphides of copper, iron, lead, and antimony, have been mined, but have discovered only in nests usually of small dimensions. Large superficial masses of magnetic iron with the red and brown oxides are not scarce.

In numerous valleys, the sources of whose rivers are in mountains of crystalline slates, gold in grains larger than usual is found, which has been the object of long-continued search, especially in the plains of the Nera and Maros. Formerly the Zigeuner, who, dwelling in tents, found nowhere a home, was bound to furnish a poll-tax to the Government of quill gold equal to 2 ducats. In Serbia these metamorphosed slates also yield the precious metal, the valley of the Great Pek from Mai lanpek to Cuchania having been streambed from the most ancient times, as the innumerable long and rounded mounds of detritus abundantly demonstrate. The washings have since 1850 been abandoned, the gravels having probably become so impoverished as to no longer pay for the labour of concentrating. Von Herder, who visited the valley in 1846, remarks that only four goldwashers remained, who during the summer months easily earned 2s. 6d. per diem, selling the gold at 2s. 9d. per dram. If this statement were accurate little doubt can exist but that washing on a large scale with modern appliances would ensure excellent results.

In Hungary gold-washing still continues along the valley of the Maros, which drains the celebrated auriferous basin of Transylvania, or Siebenbürgen. From several analyses made by the writer from the gold-bearing rocks of Czerna R-ka, in Serbia, the gold appears to be enclosed in the numerous quartz lenticles so abundant in these schists; many samples have assayed as high as  $\frac{1}{2}$  oz. to the ton.

In the Banater domain, in which are situated the contact deposits, the crystalline schists are mostly concealed under a thick series of sedimentary strata, but westward the schistose ranges of Verschetz, Dognacska, and Weisskirchen invade in long promontories the Hungarian plains, and have their flanks and debouching valleys filled with tertiary and recent beds.

EMPRESSARIO.

Cuchania, June 17.

## MINES AND MINING ON LAKE SUPERIOR.

**SIR.**—We commonly say there are exceptions to all rules, and when we talk of our Lake Superior mines we hold the Calumet and Hecla Consolidated as the exception. From 12 to 15 and 20 years ago, however, we had some very profitable mines in Keweenaw, Houghton, and Ontonagon counties, when the Calumet and Hecla was not thought of. For instance, the old Cliff, in Keweenaw county, was well known by you to be a very rich mine, and the Central, in the same county; likewise the Copper Falls, Quincy, Pewabic, and Franklin, in Houghton county, and the Minnesota and National Mines in Ontonagon county. The old Cliff got under a cloud for awhile some little time since by running off the main lode; this has just now been proved by a cross-cut of several feet in the foot wall, which struck the main lode exceedingly rich, and if the course opens out on the main lode properly there is not a question but the Cliff Mine will shortly declare its old-fashioned dividends. The Central Mine is richer to-day than it ever was before; Copper Falls, I believe, do not look quite so bright, but the change is only looked upon temporarily. The Quincy, in Houghton, although getting down near the 300 ft. level the lode is as rich as ever; good and regular dividends, and likely to do so for many years to come.

Pewabic and Franklin Mines of former years, although rich enough for regular dividends, yet through most wretched management the company felt discouraged, and leased the mine for a term of years on tribute. Of course this system gave the company a small profit, but the question may be asked what was the state of the mines when the term of tribute expired, when the tributer was allowed to work the mines as he chose? This, of course, can better be imagined than described. Fortunately, however, for the stockholders they got in a new board of directors, a new treasurer, and local agent, and the little funds in the treasury have been laid out judiciously in placing the mine in a mining-like manner, and after the period of nearly three years hard labour the agent, Capt. Johnson Vivian, has got the whole works in good and profitable condition for the stockholders for years to come.

Minnesota Mine, in Ontonagon county, held rich down to about the 150 ft. level, but the last two levels, 160 and 170, looked poor. This, with considerable trouble in keeping the upper part of the mine open, being extensively stopped out for mass copper, dividends fell back, and the company sold out. The new company went into expensive useless machinery for pulverising copper, and they also got discouraged, and allowed the mine to be worked altogether by tributers. Masses of the pure metal being very tempting to the poor tributer, the mine very soon was allowed to suffer, and the tributers took the harvest. The mine was allowed to fill with water, and, of course, became comparatively idle, except a little exploring at surface. The National Mine being on the same lode, and immediately close by, soon began to feel the Minnesota water, and a though a 10 in. pump would easily keep both the mines dry, the National Company seemed to feel somewhat discouraged, and finding the Minnesota Company's tributers were doing well for that company, they took an idea that they would follow the same principle by letting in tributers also. The prevailing opinion with all mining men is, if those two mines were consolidated and about \$50,000 laid out in them judiciously, there would not be a better run of mines known. With the going down of these mines the whole Ontonagon mines suffer, as though any one lode is a criterion for another. The fact is, there are as good mines in Ontonagon county as there are or were on Lake Superior. All that is wanted is the proper amount of capital and judicious management.

Lake Superior, June 6. A STOCKHOLDER AND MINER.

## EXCHEQUER GOLD AND SILVER MINING COMPANY.

**SIR.**—In last week's Journal there was an article upon the value of the ore produced in this mine with the extraordinary and incredible results of the O'Hara system of refining which, as your correspondent but too truly observes, has produced an overwhelming feeling of disappointment to directors as well as shareholders; but I trust, for the sake of directors and shareholders alike, that the matter will not be permitted to be shelved by a mere expression of disappointment, but that some action should be taken at once, so that an investigation should be entered into with the view of holding someone responsible for the statements made from time to time. There must either have been a serious blunder in the treatment of the ore under assay, or an audacious imposture and fraud has been systematically contrived at, which, if proved, would render the parties concerned, whoever they may be, liable to a criminal prosecution. It would appear utterly incredible that within a very short period of time, when the prosperity of the mine was represented as a certainty and success, when early dividends were reckoned upon at enormous percentages, when for weeks and months a considerable space of the columns of your Journal were devoted to articles written by a firm on the riches of the mine that those who read them at the time relied upon the glowing statements as genuine and truthful; and now that a totally different state of things is brought to light, this firm who have caused many innocent persons to invest their money in the shares when they were as many pounds in comparison to shillings as they are now in value, are absolutely silent, and have ceased to report anything more about the riches of the Exchequer Mine.

The directors screen themselves from blame by representing that they have been deceived and disappointed, but such excuse will scarcely hold good, and certainly does not speak well of their management as trustees in the interests of the shareholders, and the question very naturally arises, by whom and under what circumstances have they been deceived and deceived? Has the manager of

the mine (Mr. Chalmers), Mr. Romaine, C.B., Mr. Algernon Joy, Mr. Mansell, and others, deceived them? Let some of these experts speak for themselves as they are represented to have done at the general meeting held on April 11, 1876.

Earl Poulett (the Chairman) said:—  
Everything was as satisfactory as any mine in the world could be. He was a shareholder, and all he could say was, as the result of his opinion, he would take for his stock four times the amount that could be had in the market. There were some 5000 shares held in reserve, which would at some future time provide capital for additional stamping power, without interfering with or reducing the dividends paid to shareholders. If these 5000 shares were sold at 2s. or 2s. 6d. would be provided for all eventual purposes.

Mr. Romaine, C.B. (a director), stated:—  
To show how easily shareholders could investigate their property, he went to the mine, was with Mr. Chalmers ten days, and back in England in two months. He had never sold a share, nor did he intend to sell anything like the present price. There was something like 600 tons of ore ready at the mill, sufficient to last till the snow had gone. If only a fair quantity of ore were sent to the mill, (say) but \$100 grade, he felt perfectly satisfied the result would be a net profit of 100 per cent. upon the entire capital of the company. He should not be content even with that, as he had no doubt they would be able to do much better. He was no reason why in a couple of years they should not have 50 heads of stamps at work, as there was ample mineral available to keep them constantly employed. Nothing could be more satisfactory than the scientific, masterly, and generally able manner in which Mr. Chalmers had conducted every detail, and he deserved the complete and entire confidence of the board. He believed Mr. Chalmers' interest in the mine would make him a wealthy man, and that handsome profits would be realised by all who had associated themselves with him.

Mr. Algernon Joy represented:—  
That he was a month at the mine, and five weeks in San Francisco, at the latter place he saw a great many mining engineers and mining investors. There was a very little doubt in his mind, when he visited the mine, that the charges were strongly in favour of the mine, and that the mine would turn out worth from five to fifteen times the capital of the company. At the Exchequer, as far as the workings had been opened up, there was good paying ore in every run, and there was very little doubt that good ore would continue to be opened out. Some of the Comstock mines in the same locality had been sunk 1500 ft. before ore was met with. Others opened out from surface returning in a few months from 10 to 100 times the capital expended upon them. Assuming 20 tons per day for 300 working days per year, upon an ore of the average value of 95¢ per ton would give 450,000 a year, or 45 per cent. on the capital of the company; at 10 per cent. that would make the mine worth 45¢ each; and at 25 per cent. the shares would be worth 11¢ 5¢. He did not say it would not act even better than that, because great results were the peculiar character of silver mines in that formation. Making every possible deduction, the investment was unquestionably a very good one. He had measured the ground and took samples, and after making a considerable discount there was no doubt that if they did not sink any more, nor made any further explorations, there was enough ore ready to be stopped away that would return at least double the capital of the company.

This same gentleman had evidently reckoned his chickens before they were hatched, for he is made to say in an article, page 1248 of the Journal, the following:—

I cannot think that it is either right or expedient that our valuable property should be bolstered up with exaggerated or unsound statements, kindly altered, therefore, to play the part of Devil's advocate in reference to the special meeting of shareholders held on the 1st instant.

The time has surely arrived when these gentlemen should be challenged and called upon for an explanation of the reasons which induced them to make these extraordinary statements. That they have been bamboozled and deceived is but a mild interpretation to be placed to their credit, and it rests with the shareholders to declare whether they are to be content with the mere dismissal of the manager, when other parties must be equally to blame in what appears to be nothing short of a wicked and audacious imposture.

Lloyd's, Royal Exchange, June 25. ANOTHER SHAREHOLDER.

## UTILISING BLAST-FURNACE GASES.

**SIR.**—The advantage of forming furnaces with close tops, in order that the gases evolved may be collected and employed as fuel, has long been recognised, but it is usually considered that the utilising of the gases somewhat interferes with the charging. In furnaces heretofore constructed the top has been closed by means of a conical valve, which has been drawn upward into a circular orifice formed in a conically shaped metal top, which has been fixed on the furnace. This valve and fixed top have together formed an annular trough, into which the charge has been placed, such charge being delivered into the furnace by lowering the valve. The conical valve, of course, had the effect of deflecting the charge towards the walls of the furnace, which, being exactly the opposite of hand charging, is certainly an objection. To remedy this, Mr. W. S. Williamson, of Murtlake House, who is well known as a practical ironmaster, has recently patented a very ingenious arrangement, a brief description of which may not be uninteresting to the readers of the *Mining Journal*. He arranges the valve to rest upon the fixed top instead of pulling up under it, so that it has to be raised when the charge is to be delivered into the furnace, being lowered to close the charging orifice. It will readily be understood that by this arrangement the falling charge, instead of being deflected towards the walls, falls well into the central part of the furnace. In addition to this advantage, the furnace may be charged to a greater height, and the valve can be so set that it is free to act as a safety-valve in the event of an explosion within the furnace. The gases are withdrawn from the furnace in the ordinary manner, or are withdrawn through a flue or pipe communicating with an annular flue formed between the fixed top and the top of the brickwork of the furnace.

To render the exact character of the invention more readily understood, it may be stated that on the top of the furnace is mounted the conically shaped metal top formed of cast-iron. A central opening is formed in the top as usual, but the opening is larger in proportion than the ordinary tops of close topped furnaces. The margin of the opening is turned so as to form a seating for the conical valve, the lower edge of which is also turned to fit the seating. The valve is formed of wrought-iron or steel plate riveted or attached to a ring of cast-iron, which is turned to fit the seating, or this ring may be made of wrought-iron or steel if preferred. The upper end of the cone is secured to a square shaft, which is arranged to be guided to move in a straight line by means of pulleys formed with flanges which enter grooves in the side of the shaft, but the arrangement may be varied—as, for example, the shaft may be round and be guided by grooved pulleys, or with V-grooved pulleys, bearing against the corners of a square shaft, or the said shaft may be arranged to slide up and down in guides. The pulleys are fixed upon shafts, which are fitted to revolve in bearings, which are sustained by framing. Upon one end of the framing is formed or secured the standard which constitutes the fulcrum for the lever which is employed to raise the valve. The inner end of this lever is connected to the shaft by means of chains, which are secured to each side of the said shaft. The outer end of the said lever is acted upon to raise the said valve by ordinary or suitable means.

When the said outer end is depressed the inner end acting through the chains raises the valve, and the guiding pulleys cause the valve to rise in a straight line, and when the valve is being lowered cause the valve to descend straightly and truly to its seat. A passage for the flow of gases from the furnace is formed below the top by an enlargement of the upper part of the furnace, this passage extending around the said top and communicating with the said passage, which is formed and arranged in the ordinary or in a suitable manner. The opening or mouth of the charging orifice when the valve is lifted is about equal to the inner diameter of the upper part of the furnace. This is of importance—that is to say, it is of importance that such opening shall not be less than the said inner diameter to any great extent, and in some cases it might even be a little in excess of the said inner diameter. The reason for the said proportions is that if the said opening be too small or be of the ordinary size in proportion to the furnace the benefit of the employment of the valve arranged to rise when opening is lost, because the larger pieces of the charges tend to shoot past the centre, and to collect at the sides. When the proportions indicated are retained there or thereabouts a good distribution of the charge is obtained.

The ingenuity displayed in the arrangement will, I think, be generally acknowledged, but, of course, Mr. Williamson does not confine himself to the precise details given, as the valve may be suspended from the lever by a chain or link in the same way as the ordinary valves, the shaft and guides being dispensed with, and although he prefers to make the valve of wrought-iron or steel, to lessen the weight, it is obvious that the use of cast-iron would not affect the principle of the invention. Mr. Williamson prefers, moreover, to employ a chain, or chains, of links to connect the valve with the raising lever, in order that the said valve may be free to rise when subjected to an excessive pressure arising within the furnace; as



for example, in the event of an explosion within the furnace the said valve will be free to rise, and thereby to act as a safety-valve. Additional advantages are due to the facts that the furnace may be charged to a greater height, and that when the valve is raised the interior of the furnace is more exposed to inspection than in the case wherein the valve has to be lowered into the furnace. When the furnace is at work the materials to feed the furnace are tipped into the annular trough formed by the top and the valve as usual, and when desirable the valve is raised and the charge thereby permitted to fall into the furnace, the valve being lowered to close the opening in the top. The invention is one which I believe will be approved by most ironmasters who give attention to the utilisation of their furnace gases, and as I understand the inventor is prepared to offer them liberal terms it will no doubt be extensively used.

J. S.  
Congleton, June 28.

PREVENTABLE ACCIDENTS IN COLLIERIES.

SIR.—It is a fact worthy of notice that in the year 1876 the death-rate in our collieries was 86 less than the previous year, but as regards the 430 persons killed by falls of roof and sides, although it is urged that many of them may have aided in their own destruction by neglect of orders, there is another side of the question to be considered before the managers can claim exemption from blame. It is constantly alleged that "there is plenty of timber placed near to the working places," and "that it is the fault of the men if they do not use it, and place it at such intervals as will securely support the roof." In many collieries this may be very true, but if the men are paid for getting coal according to quantity, and nothing for proping up the roof, they naturally feel it to be the duty of employers to pay a distinct set of men to examine and place such timbers where most needed for safety, precisely the same as they finders for the removal of such props when done with. I have not yet seen in the official returns how many of the latter class of hirelings are comprised in the total of 430 killed last year by falls of roof, &c., but I have seen the men employed at this dangerous game of "Money versus Life." They work in gangs of three, one of whom listens for the fearful warning of the fall for which they are paid to occasion, while the other two knock out wedges and carry away the props at a given price for each, and which in the aggregate form the earnings of each gang per day.

Of all branches of mining industry I have always viewed this as the most appalling, and I have reason to believe that many deaths continue to result from this exceedingly dangerous occupation, instead of encouragement being given to science so as to obviate the necessity for manual labour inseparable from imminent risk of life. So long as the hewers of coal are paid by the output it can be no part of their duty to study the rule which provides that "no overhanging stone or other material that might become loose should be left unsupported or unremoved." It is, however, obviously the duty of the manager or his deputy to determine where timber supports are needed, and to insist upon their speedy application by men specially employed for this purpose, who are better acquainted with timbering than the hewers can possibly be, and in this case we should be materially relieved of the frightful frequency of such accidents, and such managers as now attempt to avoid censure by throwing all blame upon the thoughtless workman who preferred the risk of his own life by heaving coal to earn his daily bread instead of devoting both time and labour in putting up props to secure his master's property for nothing. It is also officially said to be "essential to safety that the working places should be frequently examined, and broken or decayed timber replaced by what is sound." Should it not be further officially defined by whom and at whose expense such examination, &c., should be applied? But instead of this we have it again and again repeated by the inspectors that "the safety of the workman greatly depends upon himself," and thus favour the negligence of his superiors, who plead at inquiries that "plenty of timber had been provided, but neglected to be used."

Instead of relying upon a large body of men inured to the risk of life from early age to manhood, and almost oblivious of the danger inseparable from their calling, to work strictly by rule, would it not be better to protect their lives by means superior to their personal acts if even obedient to the best of rules? But to do this the aid of science must be encouraged. Props may then be removed in safety, and explosions materially lessened, if not entirely prevented. Your own columns abundantly prove the apathy and apparent indifference of all concerned in the preservation of human life in collieries to suggested improvements by the dictates of humanity alone. I for one have laboured for years in this cause, still none of your scientific readers will either deny the accuracy of my statements as to the causes of human slaughter in coal pits, or encourage investigation of remedial means proposed. I may, therefore, infer that if prepared to submit a mechanical contrivance for the removal of props, and thus save hundreds of lives, my only reward would be silent contempt, and those who profess to know all that is necessary to guard the lives of their employees may remain content to be told again and again by the daily and weekly press that science has failed to devise a remedy, but this I most strenuously deny.—Southtown, Yarmouth, June 25.

C. COLWELL.

LEAD AND BLENDE ORES.

SIR.—I was much gratified to see from an announcement in last week's Journal that Capt. Richard Southey, of West Chiverton, has discovered or is acquainted with a method of separating lead from blende in treating an ore of a character hitherto regarded as of very little commercial value, and I trust he will meet a well merited reward for his ingenuity. The announcement is the more encouraging as showing that the Cornishman in spite of his supposed ignorance of the principles of ore preparation and metallurgy is enabled at a mere glance to discover how to deal with an ore that is said to have baffled both Swedes and Belgians. The annoyance and loss caused in Cornwall, Devon, and Wales—though fruitless attempts to deal with mixed ores of lead and blende are too well known to require comment, and even at West Chiverton the percentage of loss in preparing the ores—is understood to be enormous, although this is in that particular case compensated for by the miner-like manner in which Capt. Southey works the property, and the fact that the ore is sufficiently rich both in lead and blende to permit the unavoidable waste being made without absorbing the profits.

But as Capt. Southey must so well know the care requisite to return even West Chiverton ore at a satisfactory profit, I was a little surprised to see how favourable an opinion he pronounced upon a property in so remote a country as Sweden, and producing moreover an ore of very peculiar composition. I should, nevertheless, have been inclined to have accepted without challenge his opinion in the Swedish arbitration case, although the fact of arbitration being necessary would of itself lead many to suppose that the efforts made to return the ore at a profit had not hitherto been successful, but I find that his figures will not work, even leaving the cost of preparing and smelting the ore entirely out of the question; but before I refer to these may I ask him the latitude and longitude in which Orebros is situated, how it is reached, and during how many weeks or months in the year it can be so reached, and whether the property which the Hultafall Mining Company has acquired is the same about which Capt. Hoskings wrote in the *Mining Journal* a few years since? I should also be glad to learn what facilities exist for getting machinery and materials to the mines, and what outlay would be necessary to provide barrack accommodation for any workmen that might be employed, and to keep up a supply of provisions, and so on during the winter, also the number of men it is proposed to employ?

But to return to the figures. Capt. Southey states that the lode in Maxfield's shaft gave—specimens broken by himself—lead, 16.25 per cent.; zinc, 30.60 per cent.; silver, 4.3 ozs. Small at surface: lead, 8.50 per cent.; zinc, 14.40 per cent.; silver, 4 ozs. And he goes on to say that taking the average of these two analyses (which is certainly more favourable to the mine than otherwise) he finds the ore to be worth 87.10s. per ton. This is obviously a mistake, and unfortunately it throws out Capt. Southey's subsequent calculations upon which he bases his opinions. The average of the two analyses gives—lead, 12.375 per cent.; zinc, 22.5 per cent.; and silver,

4.375 ozs. (which is equal to about 1½ oz. of silver in the ton of ore). Now, the market price of metal (not "metal in the ore") ready for the manufactures is about 20s. for lead and 20s. for zinc; the ore will, therefore, contain—1½ oz. of silver, which at 5s. per oz. will be 7s. 6d., and 34½ of other metals, worth 20s. per ton when marketable, or 6s. 19s. 6d. for the 34½ per cent. Adding the value of the silver we have 7s. 7s. as the total value of all the metal contained, but as this 7s. 7s. worth is contained in a very rebellious ore, I think Capt. Southey will admit that no smelter would give more than one-half the price of 8s. 10s. per ton, which he has named, and it is doubtful whether he would himself assert that, assuming the ore to sell at 4s. 5s. per ton, it could reasonably be expected to sell at a profit. Of course the error may be capable of satisfactory explanation, but it will be evident to all that it is one which Capt. Southey for his own reputation would like to explain. Both miners and investors are well aware that a mine producing ore worth 8s. 10s. per ton as it comes from the mine could be worked far more profitably than if the price dropped so suddenly that the sale had to be effected at 4s. 5s. per ton; yet this is precisely the effect which Capt. Southey's mistake would be equivalent to.

ALTENBERG.  
City, June 27.

GOLD IN MERIONETHSHIRE—CLOGAU MINE.

SIR.—I must apologise for the mistake I made in the *Journal* of June 16. It should have been stated that the 67,182 ozs. which realised 30,000s. was obtained under different management. The mine was under Capt. M. Davies's management from Oct. 22, 1874, until August, 1875, during which time the ore crushed yielded 385 ozs. of gold.

OLD MINER.

GOLD IN MERIONETHSHIRE—PRINCE OF WALES GOLD MINE.

SIR.—This mine is situated about three miles from Dolgelly, and two miles east of Clogau Gold Mine. They have at last commenced operations. They have already discovered several bunches of lead and blende, and the ground looks promising. The gold in the above mine is mixed with black jack, lead, and other metals—copper, sulphur, and arsenic—and there may be some little difficulty to extract the gold in the presence of the different metals; but to go through the process of amalgamating the different metals Berdan's and Brittan's machines must be used. I understand that they intend driving a cross-cut into Emma's lode, which lode looks very promising on the surface, and no doubt the cross-cut will prove profitable to the owners. The Emma's lode runs into the Imperial Mine, which is on the boundary of the Prince of Wales, and stands north; they found a little gold when working some years ago, but is stopped at present, owing to the machinery.

OLD MINER.  
Dolgelly, June 15.

MINING IN WALES—LLANGAN LEAD MINES.

SIR.—You kindly published a letter from me in December last on the above mine, which was soon followed by another from Mr. Rickard, of Leeds, confirming to the fullest extent all I had said in favour of the undertaking, and I have now the pleasure of informing you that since then I find the excellent outfit of machinery sent over from Cornwall has been substantially erected and at work, that returns of both lead and barytes are going on regularly, and the mine is being opened up with great satisfaction. I am informed that from barytes alone it is expected the entire working cost of the mine will be covered, and I cannot see why this might not be the case, considering the very large lodes, and the quantities they contain. This would leave the monthly returns of lead a clear profit to the company. Over 100s. worth of lead has just been raised in eight days by one pair of men, or from one point of operation only, while other parts yield the usual quantities of about 2 tons of lead to the fathom. Seeing that the machinery has only been working about four months, it must be highly gratifying to the company to find the mine already in such an advanced state towards a profitable position, and by the end of this year, from present appearances, and what is already doing by way of returns, a handsome dividend on the outlay may be fairly relied on. I find the shares are only 2400 (5s. fully paid), and are well held, chiefly in the neighbourhood of Birmingham. A few shares, I believe, have changed hands at a good premium, but the mine seems to be little known among the public, and the shareholders are not hasty in making a cry about it, as every good thing will in due time speak for itself, and the best proof of the company's confidence in the undertaking is that they not only hold close to it, but the same management have secured and are floating another mine in close proximity to the Llangan, and I would advise others seeking for profitable lead mining in Wales to visit this locality and suit themselves, there being plenty of unworked mineral ground to be found, and on the same line of lodes.—June 26.

SURVEYOR.

CARDIGANSHIRE MINES, A.D. 1877—No. XVII.

SIR.—Resuming my remarks, I intend offering a few observations on the ground adjoining Tyn-y-iron Mine, and to the west of it, on the farm of Troedriw Sebon, and which I shall call West Tyn-y-iron Mine. The both lodes seen in the Tyn-y-iron Mine pass through this grant, and can be seen by driving in a cross-cut from a ravine at the western boundary 10 fms., which will intersect the lode at a depth of 15 fms. from surface, as the ground rises perpendicularly over the ravine. If the lodes are found of the same character and of equal value as they are seen in the Tyn-y-iron Mine, of which there seems no reason to doubt, all that will be wanted to place this property in a state of permanent profit is the erection of good machinery for manipulating and dressing the ore, as backs for 100 fms. deeper than the point indicated can be obtained by the driving of short cross-cuts down to the River Rheidol. A water-course has been brought through the grant, and the river can be made available for all purposes, and there can be but one opinion as to this being a very valuable piece of mineral ground. The royalty is 1-16th, guaranteeing a lease at its expiration for 21 years, or equal to 23 years' lease from the 7th inst.

I have just been looking over rather an interesting document as to the cost for management of the Cwm-Erfin Mine during its last working, and I can guarantee that such proceedings will never take place when the same circumstances shall occur either at Tyn-y-iron or at West Tyn-y-iron. In 1851 the agency amounted in all to 176s. 10s., and sundry payments, which include a great number of London office items, to 122s. 16s. 6d. This was a fair amount for agency, and quite enough for sundry payments. In this year the mine made a loss of 1611s. 6s. 7d. The agency continued the same from 1851 to the end of 1855, and sundry payments in the year to 157s. 1s. 6d. The profit this year was 847s. 17s. 2d., and no doubt the time was thought to be opportune for increasing London agency, office, and other items of expenditure. In 1856 the agency was 193s. profit, 103s. 12s. 5d. In 1857, 221s. 10s., and loss 1100s. 10s., so too high a figure would not do. In 1858—agency, 221s. 10s.; sundry payments, 241s. 6s.; profit, 1182s. 17s. 7d. In 1859—agency, 221s. 10s.; sundry payments, 350s. 12s. 3d. In 1860—agency, 242s. 5s. 4d.; sundry payments, 333s. 5s. 9d.; profit this year, 3050s. 17s. 6d. In 1861—agency, 305s. 15s.; sundry payments, 418s. 9s. 10d.; profit, 2155s. 0s. 7d. The agency and sundry payments formed rather a heavy item, but not so in the eyes of the London management, so in 1862 the agency was 305s. 15s.; sundry payments, 946s. 10s. 5d.; and profit, alas! 1066s. 15s. 5d. In 1863 agency increased to 320s. 9s.; sundry payments, 401s. 9s. 8d.; profit, 2482s. 1s. 1d. In 1864—agency, 328s. 4s.; sundry payments, 481s. 19s. 5d.; profit, 3671s. 0s. 5d. This profit was too tempting to let pass without a good increase of agency, so in 1865 the agency was raised to 449s. 4s.; sundry payments, 477s. 2s. 4d.; profit, 3739s. 19s. 6d. In 1866 the agency increased to 479s. 15s. 8d.; sundry payments, 471s. 4s. 9d.; profit, 3652s. 3s. 7d. In 1867 the agency increased to 494s. 8s.; sundry payments, 554s. 6s.; profit, 3674s. 7s. 7d. This was too much profit for the shareholders, so in 1868 the agency increased to 508s.; sundry payments, 487s. 16s. 9d.; profit, 2193s. 0s. 6d. Not content with this, in 1869 the agency increased to 520s. 12s.; sundry payments, 389s. 10s. 6d.; profit, 1715s. 2s. 2d. Anyone would have thought that this small profit should have reduced the agency, but no—in 1870 the agency again

increased, and was no less than 533s. 4s.; sundry payments, 428s. 17s. 3d.; profit, 603s. 14s. 2d. This was the climax; the shaft was never sunk, and, as the ore was taken away the water allowed to rise. The last straw had broken the back of the donkey, so in 1871 the agency was reduced to 396s. 12s., sundry payments to 305s. 8s. 9d., and the mine sustained a loss of 2334s. 3s. 4d., so it was time to shut up, and shut up they did; and now, if you ask why Cwm-Erfin has stopped, you would be told that the last company left it miserably poor. I give this as a sample of what is being done, and if shareholders permit such a modus operandi, who is there who would not say—"Serve them right?"

Goginan, June 26.  
ABSALOM FRANCIS.

THE MINING DISTRICT OF LLANRWST.

SIR.—It surprises me that anyone speaking or writing of the district of Llanrwst should silently ignore the Llanrwst Lead Mine. It is certainly the most imposing and pretentious mine of the district, whatever reasons there may be for such a display and pretension. It may be that Mr. Watson considered that this mine was shortly about to speak for itself, but even then it could not reasonably be considered unentitled to notice. I would not speak depreciatingly of either of the mines he has named, but should not consider this mine at all complimented by being placed in the same category unless with a distinction. Whatever the mines he has enumerated may be, and I entertain a favourable opinion of most of them, they have much to do in development and provisional arrangements before they can be placed on a level with this mine. It is a delusion to assume that mines can be extensively and successfully opened and operated by mechanical and manual appliances without a considerable expenditure of time and money. The Llanrwst Company early perceived this and as readily consented to incur it. The result we shall soon be in a position to demonstrate, and no one looks forward to the event with greater pleasure and assurance than I do, as no one has spoken or written more highly of the district in general, and of this mine in particular, than I have done, and at a time when it sorely needed supporters and patrons, nor has anyone incurred more odium and displeasure than I have from defending the character of the district against the ravages of mismanagement and ignorance. I would like to ask what would have been its condition at this time but for the outlay, energy, and success made and attained by this company? To it is unquestionably due the revived interest which has been taken in the district. I will also add that whatever may be the ultimate value of the mines, Mr. Watson has with his well-known ability delineated that this mine will take the lead of the district and maintain it for years and years to come, no matter what energy and skill may be displayed by them. In the race we have nothing to fear in that respect. We are ahead of them in development, resources, and mechanical appliances, and I pledge myself that the best that can be done shall be to maintain and hold that position.

In troubling you, Sir, with this communication, it may be proper to say that as the manager of the Llanrwst Lead Mine I am actuated solely by the obligation of duty, impressed that to remain silent in respect of such an omission from whatever motions occurring would be to connive at a circumstance prejudicial to the mine and company I have the honour and pleasure to represent. We need no foreign aid, and will allow no one to reap—without a protest on our part—what we have so assiduously and generously sown. I find that views which were not entertained by parties preceding me in this field of mining respecting the prospects and value of the district at the time of my arrival here are now warmly espoused by them, and echoed to their personal advantage. ROBERT KNAPP.  
Llanrwst Lead Mine, June 25.

MINING IN CARNARVONSHIRE—LLANENGAN DISTRICT.

SIR.—Being at Pwllheli, I accepted the invitation of a friend to make a tour through the parish of Llanengan. It being a most favourable day for a drive, I enjoyed the scenery very much, and more especially my visits to the various mines and quarries in the locality. The first place of note visited by us was the Mynydd-y-Cwml mountain, on which there are three set stone quarries. Two of them are making immense profits. They are situated in close proximity to the St. Tudwells Roads, which affords every facility for exporting the set-stone. From here we drove to Abersoch, a pretty rural village situated on the sea coast. There is a very good shipping port here, which gives every convenience for transit to and from the mines. After lunching at the St. Tudwells Hotel, where everything requisite could be obtained, we visited the Asheton and West Asheton Mines. These mines are worked by a London company, and from what I gleaned they are making regular monthly returns of lead and blende ores, sufficient almost to pay the working cost of the mines. We saw some magnificent piles of lead ore at surface, which were raised from the 60 west in the West Asheton and from the north and south lode in the Asheton proper. We went from here to the celebrated Tan-y-bwlch Mine, which is on the same lode as the above-mentioned mines. The mine is worked by a private party from about Liverpool. The monthly returns here are about 60 tons of lead and 40 tons of copper ores, which bring on the average 15s. and 18s. per ton respectively. The owners of this mine must be receiving large dividends. The dressing-floors are very compact, and contain all necessary machinery for dressing the ores in an economical manner. I was informed by a miner that there has been a large "gulf" of ore discovered in the 70 west, and that the lode lets out a large quantity of water, which is draining the Pantgwyn Mine. This mine is also on the same lode, and is situated about 320 yards from the forebreast of the above-named 70 fm. level in Tan-y-bwlch.

The Pantgwyn Mine, together with the estate on which it is situated, is the property of the Messrs. Gundry, from Cornwall. Upon asking the reason why it was idle, I was informed that at the depth of 30 fms. the lode was intersected, which yielded good stones of lead, copper, and blende ores, samples of which I saw at surface, and that a large stream of water was met with, which completely overpowered the small engine. This water is now being drained by the Tan-y-bwlch Mine. Preparations are now being made to start the Pantgwyn Mine again, and there is every probability, considering its situation with respect to the Tan-y-bwlch Mine, of their opening out a very profitable mine, with little or no water to contend with. The Messrs. Gundry may well congratulate themselves on being the possessors of such a property. Fearing that I am filling up too much of the space of your valuable *Journal*, I reserve reference to the Port Nigel and other mines until my next letter.

PEDESTRIAN.

MINING IN ST. AGNES.

SIR.—In years gone by the parish of St. Agnes furnished evidences of metallic wealth which placed it amongst the best in the county of Cornwall; and I am of opinion that ere long it will become distinguished again for its productiveness. The resources of both tin and copper in the parish are very far from a state of exhaustion. Of tin mines several are now at work, and yield a little profit, despite the low price of tin; of copper mines, although none are at work at present, many in past times yielded enormous profits, as I believe some will do in the near future. Great Towan Mine yielded about 200,000s. profit in a few years; Great Wheal Charlotte also enriched several previously poor people; and South Towan and Tywarthaile Mines have yielded immensely. None of these are deep mines, and therefore may be worked again; but I prefer copper mines more shallow and less expensive in development as subjects for the investment of capital. I could mention the names of several little mines which are specially worthy of attention in that district; but I will just now mention only one which, I am informed, is about to be worked; a sett having been granted to some parties represented by Mr. R. Symons, C.E., of Truro. The mine is in the land of Mr. E. W. B. Williams, and has been worked only, I believe, to the adit level, which at the principal shaft is 45 fms. deep. At the bottom of the adit the miners say a rich bed of copper ore was left by the old company, which they could not take away for want of pumping power. I am told that to work this mine (East Ellen) a pumping engine of 50-in. cylinder should be erected at once, that the copper ore may be taken away and the lode



explored in depth. There is a long run in the sett on the course of the lode, and as there are several other copper lodes within the limits, I consider the mine presents very fair prospects of yielding considerable profits. It is about 3 miles from the "Navy," a peculiarly large deposit of copper ore, somewhat like the tin carbonates in the St. Ives district. From this spot the late Capt. John Oates, of Roseinvalle, derived a profit on his shares of many thousands of pounds sterling. The district immediately surrounding East Ellen is decidedly cupriferous. As many labourers in my neighbourhood are in want of employment, I should be glad to see mines which will pay well revived and fairly prosecuted. J. G. Mount Hawke, June 23.

#### ST. AGNES DISTRICT.

SIR.—Those persons who entertain a notion that mining in St. Agnes is likely to diminish further than it has will, happily for the mining community, find themselves in error. I have only just heard that a highly promising little mine west of Mount Hawke, and called East Ellen, is about to be re-worked. A sett has been granted of it, and I understand that an influential party is likely to take it in hand, erect a 50-in. pumping-engine, and explore the main copper lode below the adit, where it is rich, but which the old company could not do for want of funds. I have a good opinion of the mine, the lode being large and valuable for a considerable length at the bottom of the adit, where, however, the water is too plentiful to admit of any operation without a steam-engine. The working of this mine may lead to the re-opening of South Ellen at the west, which certainly deserves further development. AN AGENT. Redruth, June 25.

#### CWM DWYFOR MINE.

SIR.—When I visited this mine in company with the late much respected and lamented Mr. Thomas Harvey in the month of May, 1873, I formed a favourable opinion on its productive resources in prospect, but I expected ere this that it would become self-sustaining. I see from the report of the agent in last Saturday's Journal that the prospects are still good, and I hope that his faith will be found to rest on a justifying basis. He must remember that "a good bal makes a good cap'n," and that nothing else will do it. Dolcoath has made more than one good captain; Tincroft also, and Tresavean, besides many other mines. If Capt. Jewell makes Cwm Dwyfor rich—i.e., if it turns out to be a prize—he may expect not only the verbal acknowledgment that he is a good captain but a "testimonial" of value according to modern custom. But if he should not discover lead, copper, or other ores from which to declare dividends he will never become a good captain, however clever, diligent, and upright he may be. I hope, therefore, that in the recollection of the old adage he will not fail to make his mine rich as early as possible. If he does not, let him never expect that the company can forgive him.—June 25. TOURIST.

#### WHEEL GRENVILLE—IMPROVED STAMPS.

SIR.—I noticed a paragraph in the West Briton, of June 18, referring to the Wheel Grenville meeting, upon which I beg leave to make a few remarks. I understood the Chairman to have said, among other things, that at the present time they raised 16 tons of tin a month, and with the machinery now at work they could scarcely raise more. When their new plant was in full operation he did not despair of raising 25 or 30 tons a month, but this would require a new stamping engine, and 30 or 40 additional heads of stamps at work.

Now, Mr. Editor, through your valuable Journal I beg to inform the Chairman and company of Wheel Grenville that I am quite prepared to contract with them, or any other mining company, at the shortest notice, for the erection of an improved stamp of 30, 40, or any greater number of stamp-heads, no matter to what extent, that might be required, which shall be capable of stamping, on an average, at least 2 tons per head per day of 24 hours of the average hardness of tinstuff contained in the mines of the two counties, together with the first course of dressing-floors that shall save 50 per cent. upon the labour cost alone when compared with the mode generally adopted in 95 per cent. of the mines of this county. This I am quite prepared to contract for upon warrant, to do the duty named with the stamps, and save the labour cost referred to upon the said dressing-floors, which I have already done and proved beyond contradiction.

It has been repeatedly acknowledged by mining authorities that 1 ton per head per day of 24 hours is the average duty of the present stamping machinery of this country, but I am positive that a great portion of the so-called stamping machinery that is to be found in many of our tin mines at the present time does not stamp more than 15 cwt. per head per day of 24 hours.

Mining companies will at once perceive the great advantages gained by employing the most improved and effectual machinery for treating the ores in their mines, thereby saving a large proportion of the cost of the erection of the stamps to do an equal amount of duty when compared with what is generally employed in our mines even at the present day. Should the above extraordinary increase of stamping duty upon the old stamps be deemed insufficient to meet the present exigencies of the case, I have another plan of a far greater and more effective stamps equally as simple as the old form of stamps in construction, whereby I can increase the height of blow to 20 inches, stamp at least 4 tons per head per day of 24 hours, do the same amount of work upon much less coals, save nearly half the cost in the erection of the same, to do an equal amount of duty, requires nothing but an ordinary labourer to attend the same, and would be a far greater and more complete machine than anything of the kind hitherto brought into use for the said purpose in this country. Hence the propriety of being prepared to the greatest extent to meet foreign competition, and the depressed state of our tin market, with every improved appliance at our disposal.—Sticker, St. Austell, June 23. SAMUEL SEARLE.

#### ROMAN GRAVELS—REPORT OF THE DIRECTORS AND ACCOUNTS.

SIR.—As I cannot attend the general meeting of shareholders of Roman Gravels Mining Company, to be held on July 4, I trust you will with your usual courtesy allow me to make a few remarks to my fellow-shareholders on the report and accounts issued by the directors with the view of drawing the attention of those who sympathize with me, and can attend the meeting, to some points that the directors cleverly evade in their report, and to others I think the shareholders should look into.

I refer first to the accounts, which I regret to say are eminently unsatisfactory. The total cost for the year appeared to have been 22,541l. 17s. 6d. to return 35,621l. 6s. of lead and blende ores. Of the above large sum 18,622l. 6s. 10d. is put down for mine costs (this includes 735l. charged for purchase of a 60-inch engine, &c.), but the executive cleverly reduce this amount by a system of transfer to capital account, which I do not consider consists with good accounting. Thus 3511l. 9s. 10d. (including the 735l. above mentioned) is transferred, although on looking up the monthly charge for materials I cannot see where part of it was incurred. When is this continued transferring to capital account to cease? It is neither more nor less than a finessing of the accounts, and in keeping with other parts of the management. At the meeting in 1874 one of the officials of the company stated that the extra outlay would gradually diminish, but instead of this they appear to be annually increasing, although in this instance the accounts do not show how these extra costs were incurred, with the exception of the 735l. for the engine. I observe the directors pay themselves this year 500l., instead of 400l. as formerly. Are their fees in the inverse ratio to the dividends declared? With reference to this I would point out that in the Great Miners Mine there are six directors, and that during the year ending June 30, 1876, there was divided amongst them the sum of 305l., and amongst the shareholders 24 per cent. on the capital.

I come now to the report, or rather to that part of it in which they cleverly endeavour to reply to the complaints as to the management, but in which they are singularly unsuccessful. My complaint,

and, I understand, that of others also, had little or no reference to the period since the accounts were made up in February last, but to years past, and notably to distinct promises made, but which have not only not been fulfilled, but a retrograde movement inaugurated instead, and no really intelligent explanation given why they have not been implemented. I brought several of these points prominently forward last year in a letter I addressed to Mr. Robert Wilson, as chairman, and wishing some explanations to be given at the meeting in 1876, but was surprised when I received the report of the directors to find the name of Mr. Southgate as chairman. I have not a copy of the Articles of Association, but to my ignorance it appears strange to appoint a gentleman as chairman who was not *de facto* a director of the company until elected at the meeting. Of course, no notice whatever was taken of my letter.

I would beg to refer my fellow-shareholders to my former letters as to the other matters that should be rectified in the management of the company, such as regular four-weekly sales of ore, quarterly dividends, &c. A SHAREHOLDER OF SOME YEARS STANDING. June 27.

#### CAPT. TREGAY, AND PEDN-AN-DREA MINE.

SIR.—At last "the cat is out of the bag," and we can now understand why Capt. Tregay has declined to answer my questions, and why his apologists have resorted to quibbles and misstatements to distract attention from the real points. In last week's *Mining Journal* there appeared a statement of accounts for 10 months working of the mine, to the end of May this year, which discloses the true story unmistakably. The roving "Tourist" told us that he was informed the large profits now alleged to be made were caused by the discoveries met with since Capt. Tregay purchased the property. Taking the accounts above referred to this turns out to be untrue. It seems that the total returns of tin, copper, and arsenic have realised 15,748l. 5s. 11d., while the costs, including dues, &c., have been 13,245l. 13s. 11d., leaving an apparent profit of 2502l. 12s. (though they have divided 2700l.) The average monthly cost was 1324l., or just about 400l. a month less than Capt. Tregay's minimum during the final five and a half months of the late company, which "Argus" drew our attention to. After his "considerable reduction" in the costs previous to March, 1876, and his promised further decrease, Capt. Tregay managed to spend 1700l. a month as the lowest he could do with in the final few months of the company.

With the property in his own hands, he succeeds at once in reducing the costs to as low as 1300l., though he has the expense of dressing double the quantity of tin. The result is that but for this reduction in the expenditure there would still have been a loss of 126l. per month, or 1260l. for the 10 months, so that the profit shown is entirely owing to reduced expenditure, and not to increased returns. Taking into consideration the actual reduction of costs (400l.), and the additional dressing cost for doubled returns, the present outlay on the mine must be at least 600l. per month less than the minimum of the late company during its final few months, after Captain Tregay's announced large reductions, in view of the company disposing of the property.

In face of the above facts, I was not far wrong in asking in my former letters on what scale the mine was being worked. Is it on the plan which Capt. Tregay considered requisite for its success (or even during the temporary emergency referred to) when he managed for the late company, or upon some new and improved principle which he has only recently discovered? A difference of 500l. per month cost, as compared with the company's maximum average, and even 400l. compared with its minimum, to accomplish the same or better objects, would certainly have been an agreeable boon to the late shareholders, and perhaps this difference in expenditure might have prevented them parting with the mine. June 26. W. X.

#### SOUTH PARK-OF-MINES.

SIR.—This mine is situated, as the name suggests, south of the Park-of-Mines, and between the villages of Indian Queens and Blue Anchor, near St. Columb. I have been informed that a large capital has been expended in, or in connection with, the mine, and it has been intimated to me that economy has been sadly wanting in such expenditure. One of the officials is said to be not distinguished for his sobriety, but many persons who are not members of the temperance society have been good miners. I admit I have no interest in the mine, and I write this note in the interest of the shareholders, who should look after their property by causing an independent report to be made on the mine, on the management, and the accounts that they may see whether everything has been fairly done, and whether there is any metallic lode operated on, and if so how many of them are found in the sett. JOHN BULL. St. Columb, June 21.

#### PARYS MOUNTAIN MINE.

SIR.—I have again to thank Capt. T. Mitchell for excellent information concerning the prospects of this great mining property, in the *Journal* of June 23, and the favourable predictions certainly seem to be very near a successful attainment. I am glad to see that the ground in the 90 cross-cut south is considerably easier for driving, and looking better for cutting the intermediate lodes. Should the ground continue as easy in this drive an early strike must result. I am also glad to see another rich branch has been cut in the 90, and another feeder of masses of ore close at hand. The angle of the whole mass of ore above, dipping only 30° from the perpendicular, shows that shareholders have not long to exercise their patience before the reward of a great success and a restoration of Parys Mountain to its former position of wealth. The easy nature of the ground in the 90 cross-cut is most opportune, and fortunate indeed for the proprietors.—Fintshire, June 27. MINING ENGINEER.

#### AN EVIL NEUTRALISED.

SIR.—In a district with which I am conversant there lately lived a gentleman of considerable wealth and influence. He was well known to be excessively prone to believe the stories he heard against his agents and servants, and he appeared to have a peculiar relish for prejudicial news, and so had his wife. It not unfrequently happened that persons in his service would be dismissed without any assignable cause, the real cause being no doubt evil speaking credited, and no opportunity given for defence to the injured party. Some years ago the gentleman wanted a person to fill a responsible situation in one of his establishments, and he fixed upon a mine agent for the post. That agent, well knowing the gentleman's propensity to credit rumours, especially unkind rumours, thought it well to have some security against them, so after the terms of office, &c., were arranged he said "Before I go, Mr. W., I beg to ask you a favour. 'What is that?' said Mr. W. 'It is this, Sir, if ever you hear anything against me that before you act upon it you give me an opportunity to defend myself.' 'It shall be done,' said Mr. W., and I believe that that agent is in the situation at this day. I have known several dismissals given by that gentleman without any intimation of the reasons. I knew a poor man turned off by another gentleman because when he passed he omitted to lift his hat. June 21. TOURIST.

#### MINING DEBTS.

SIR.—Seeing that it has been discovered that one mine in Cornwall is indebted to the bankers in the huge sum of 25,000l., I think that it would be wisdom in all mining companies for the time to come to have a balance-sheet showing all assets and liabilities up to the day of the periodical meeting presented thereat. It is believed that in many mines in this county the liabilities are very heavy, and that the amounts are unknown to the general shareholders—known only perhaps to the committees and bankers. And some of the mines so indebted are paying quarterly dividends of profit (so called), with heavy debts outstanding. This is a state of things that should not exist; the adventurers should know at every meeting their real financial position, as every business man when he audits his accounts knows how he stands. Such underhand dealings as have been exposed at West Basset militate against the mining interest, inasmuch as people will hesitate to speculate in mines

from fear of liability to pay arrears of cost. But independently of that, it is unbusinesslike to credit sales of ores up to the day of meeting, leaving five months' costs unchanged, and dividing money that ought to be applied to the payment thereof. There are mine holders should insist on having a correct balance-sheet, and the bankers' pass-book presented at every account meeting. Camborne, June 25. TOURIST.

#### THE DEPRESSION.

SIR.—The miners of Cornwall cannot well brook any retrogression in the prices of metals. When tin rises to 80l. or 100l. per ton they like to keep it there. It is now from 40l. to 44l. per ton, a price higher, I believe, than it was when Great Wheal Vor yielded profits of 3000l. per month. In the year 1835 it was down to about 35l. per ton. I think in 1838 it was only 38l., so we are better off now than then. If it be argued that labour is dearer, I say that that is balanced by the improvements in machinery for dressing, &c. Many mines now at work should be suspended during the depression if the interests of the shareholders alone is to be considered, the benefit of other people. The present depression is not attributable alone to the low price of tin; a greater reason may be seen in the misappropriation of subscribed capital to the payment of heavy premiums to promoters of the mines, which, in some cases, have absorbed most of the money paid-up. I was told lately that in the case of a little mine in Perranzabuloe the promoter received more than 10,000l. for the sett, and that the mine agent who procured the sett had not a shilling of that sum! I would not object to any reasonable sum being paid for a good mine sett, but 10,000l. is an enormous price, and such excessive charges injure the mining interest by keeping capitalists from embarking in Cornish mines. I find that the little mine referred to is to be resuscitated by Capt. L. Pryor shortly, and that it is likely to yield abundance of lead. Perranporth, June 21. JOHN BULL.

#### WEST BASSET.

SIR.—I notice in your contemporary the West Briton that Mr. Hocking, jun. (one of the committee and engineer to the company), is the auditor to the mine. What a farce! and need one be surprised to see the mine dotted over with costly machinery, which has probably been paid for out of the heavy overdrawn account. The exposure at the meeting has cast a gloom over all mining speculation, already at a low ebb, and strong reflections are being cast upon the bankers, purser, and committee for keeping the shareholders in the dark as to their proceedings. It is very well known that one of the partners in the bank was one of the largest shareholders, and on the committee, but, doubtless, seeing what was in store, quietly disposed of his interest in the concern. Comment is needless. LEX.

#### WEST BASSET MINE.

SIR.—At a meeting of the company, held on the mine last week, a frightful discovery was made—that the bankers' account was overdrawn to the extent of 25,000l., for which interest of 100l. per month is being paid to Messrs. Tweedy and Co. This fact was elicited by Mr. E. Heard, of Truro, who urged that the bank book should be produced. The chairman, Mr. Evans, was very reluctant to lay it on the table. That debt has been incurred without the consent of the body of shareholders; and, until now, without their knowledge, which is not according to the cost-book principles of mining, and, therefore, illegal. It is a case analogous to that of Clifford Amalgamated Mines, where there was a secret debt of 20,000l., brought to light on the eve of its abandonment. It is very unfair to keep the shareholders in ignorance of the debts of the company. The consequence is that the shares in West Basset are valueless—in fact, they are being given away, and a premium offered with them. I presume that the committee had hopes that the returns of tin would enable it to pay off the debt without calling on the shareholders for contributions. Such is not likely to be the case, it being doubtful whether the returns will ever meet the costs again, as I consider that the price of tin is not likely to be higher for years to come, if ever. I should be sorry to see the mine abandoned, but I think it will come to that ere long. June 25. TOURIST.

#### WEST BASSET MINE—MINING ACCOUNTS.

SIR.—The very extraordinary (I had almost said disgraceful) proceedings which took place at the recent meeting of West Basset adventurers have attracted much attention, particularly of those who, like myself, are outside adventurers in Cornish mines. That a large concern like West Basset should have been allowed to go on for a lengthened period without the partners being aware that it was deeply steeped in debt, and without proper accounts being produced disclosing the true financial condition of the undertaking, is to my mind simply inexplicable, and how the committee and purser (particularly the latter) are to justify their conduct it is hard for me to know. In fact, the behaviour of the purser on the matter of the bankers' pass-book at the recent meeting was simply monstrous. This mode of conducting Cornish mines must tend to destroy all confidence in such undertakings, and be a great injury to the standard industry of the county. I think, in justice to the adventurers in mines in general, some energetic shareholders ought to unite in demanding a full and explicit statement of the accounts and liabilities of the concern, and a report showing by what authority such large sums have been borrowed, and why the fact of such borrowing has been suppressed in the periodical accounts of the mine.

Of course, one is led to conclude that the bankers have secured themselves by the guarantee of some individual shareholder, as they can hardly expect the general body to recognise any responsibility for the debt; but what the guarantors can be dreaming of to run such a risk as they have I know not. But, be this as it may, the whole thing is so irregular that it ought to be cleared up, not only in the interest of West Basset adventurers, but for the sake of mining enterprise in the county generally. A purser who would keep his master's pass-book in his pocket, and fence with the master's demand for its production, and then to present it only under threats, and in such an uncouth and insulting manner as was the case at West Basset, would be, in my estimation, better "outside" than "inside" the management of our Cornish mines. Failing the accomplishment by fair means of what I have suggested, the Judge of the Stannaries ought to be appealed to, and he would, no doubt, make short work of the matter.

#### AN OUT-ADVENTURER IN CORNISH MINES.

#### WEST BASSET MINE.

SIR.—In 1871 some three or four local gentlemen having attained a considerable interest in this concern, much to the satisfaction of Messrs. Thomas and their friends, resolved upon removing the management of the mine to the county. The old adage, "coming events cast their shadows before," has been proved very true. Messrs. Thomas, foreseeing, probably, the results likely to accrue, advised their friends to cease their connection with the company, and how far their advice was justified is shown in the exposure made at the meeting held last week. We have got to be so well acquainted with, in too many instances, the system of managing the affairs of some of our Cornish mines, that one is not surprised to hear occasionally that there are in existence liabilities of which our confiding shareholders are unaware, but to be made acquainted suddenly with a debt of 25,000l. will, I fear, prove rather an embarrassment to many who doubtless have looked upon West Basset as a well-conducted and *bona fide* investment. At the time the books of the mine went out of our hands, from documents before me, I believe I am right in saying there was not a single known liability unchanged or unpaid; therefore it is not difficult to see the style of management that has been followed from year to year by the committee who have so ruthlessly betrayed the confidence placed in them by the shareholders.

When one considers the fact that the committee did, if it does not now, consist of two tin smelters, an engineer, and a tinstone buyer, it is easy to discern that other interests than those of the shareholders were in the minds of the executive. However, it is of no use grieving over the past, and what the shareholders have to consider is the best way to meet the difficulty. The liability of the shareholders according to the statements made at the meeting, amounts in round figures to 27,500l.—a serious item to reflect upon—25,000l. being due to bankers and 2500l. to merchants to the end of April last, to meet which a call of 4l. per share, or more (as there are, I believe, some forfeited shares), is absolutely necessary; and I am assuming that the amount advanced by the bankers is a legal debt of the adventurers, which I very much doubt, notwithstanding the audacious decisions of the Court appointed to settle the little differences between miners. Clause 7 of the Stannary Act distinctly states that no adventurers shall be authorised to pass a resolution empowering a company to borrow money, and a determined shareholder may, on principle, make it very uncomfortable for those parties who have risked their advances on such a doubtful security as an illegal resolution. As partners in a concern no management has a right to pledge the credit of other partners, and, if I am not mistaken, this is a standing rule in law.

It is well for the shareholders, and, perhaps, the country generally, that some one has taken the initiative, and insisted upon knowing the actual position of the concern in which he is interested; and if Mr. Heard will continue his exertions in other directions, strongly referred to in your paper of last week by "X. Y. Z." he will do "One and All" a service, and be justly entitled to the thanks of the whole mining community. I do not know that he, or some other advocate of proper accounts, might not go farther and insist on a sufficient call being made



## Meetings of Public Companies.

## NEW QUEBRADA COMPANY.

An ordinary general meeting of the shareholders was held at the Cannon-street Hotel, on Monday, Mr. N. LEAROLD in the chair. Mr. T. G. GILLERPIE (the secretary) read the notice calling the meeting, and the report of the directors was taken as read. The CHAIRMAN said he had little to add to the information contained in the report, and in all probability, they would think it desirable, as he did, to derive their information from sources other than the Chairman. He had generally found that the subject on which the shareholders desired information was as to the progress of the railway, and on that point, he had to tell them that although the progress had been slight in comparison with what the directors hoped it would have been, yet it had been sure and uninterrupted, and at this moment the railway was completed to within about 14 miles from the mouth of the mine. (Hear, hear.) There was a time when he was assured that that was the case would have been regarded as a great step in advance. The directors had now to report that this was an accomplished fact, and he had further to state that there was no reason whatever to apprehend that the line would not shortly be completed—that was to say, there was no difficulty of an engineering character or otherwise which stood in the way of its progress and completion. It was thought desirable when the line had been constructed and completed as far as La Luz it should be formally opened. There were reasons for that of various kinds, and amongst them this—that the period for which the President, Gen. Guzman Blanco, held office was likely shortly to expire, and as he had taken so prominent an interest in the success of the enterprise it was thought due to him that it should be opened during his tenure of office. On that occasion Gen. Guzman Blanco, as President of the Republic, did the Bolivar Company the honour to formally inaugurate the opening of the line, and the affair passed over with every circumstance of satisfaction to the company. The Bolivar Company on that occasion was represented by Mr. Mercer, and, as far as could be ascertained, the general interest taken in the enterprise was likely to bear fruit for the benefit of the company in future. The President had in a most unequivocal manner expressed his great gratification with what he saw, and with the spirit of enterprise evinced on behalf of the company. The President not only went over the railway but visited the mines, and went through them as far as possible, and was very favourably impressed by the mines as well as by the railway. It was also thought desirable for the avoidance of complication that the line should be taken over by the Bolivar Company, and so far as the board of the Quebrada Company had a right to express an opinion upon the subject at all they certainly favoured the Bolivar Company taking over the line. By this means complications had been avoided on the part of the contractors, and, moreover, the company having got possession of the line began at once to carry away ore on the terms of the contract—that is to say, to bear themselves the cost of carrying it, by means of mules and donkeys, from the mine to the terminus of the line, and afterwards to the port of Tucacas. Thus 1000 tons of ore had been carried by the railway company since the line was opened. Altogether there had been brought down a quantity of about 1500 tons of ore, and sent to this country, and about 1300 tons more might be said to be on its way. With regard to the health of the staff, it had been almost all that could be desired; he said "almost," because the superintendent, Mr. Harry, was compelled to return home. His place was temporarily filled by a gentleman who acted as purser of the mine, Mr. Francis, on whom, even during Mr. Harry's tenure of office, very much depended, and under the advice of Mr. Darlington, and fully in accordance with his own wishes and desires, the board appointed Mr. Francis as Mr. Harry's successor. The appointment had been made tentative until Christmas, and if Mr. Francis gave satisfaction he was to have the more permanent appointment of mining superintendent. With the exception of Mr. Harry all the officers and men had enjoyed good health, which was a great relief to the minds of the directors, because at one time apprehension existed as to the preservation of the health of the staff. In his opinion there need exist no apprehension upon that point now. He now approached a subject in comparison with which no doubt the shareholders would think all others trivial and unimportant. After the death of Mr. Forbes, the late consulting engineer, it became the duty of the board to appoint some gentleman as his successor, and the directors all felt it was very desirable indeed that it should be made a condition of the appointment that the gentleman receiving it should himself go out and examine the mine, for the purpose of ascertaining the real extent and value of the company's mineral property, and determining from practical observation the best way of developing and working it. That view of the subject was brought before the shareholders, who unanimously agreed with the directors on the point, and Mr. Darlington, a gentleman who had been recommended to the board by the very best authorities, and who, after enquiry, had secured the fullest confidence of the board, and seemed also to possess that of the shareholders, was unanimously selected as Mr. Forbes' successor, subject to going to Venezuela for the purpose of making a personal examination of the mine. Almost immediately after the last meeting, at which the shareholders approved of the intention of the board, Mr. Darlington was formally appointed, and went out to Venezuela, and spent more than one month at the mines in personal investigation of them, and had there the assistance of Mr. Francis and all the other aid which he required for the purpose, and made, no doubt, according to the opinion of the board, the very best examination possible of the mine. When he came home Mr. Darlington made a report, and the directors immediately upon receiving it deemed it their duty to send it to the shareholders, leaving them to form their own opinion upon it, and to receive, as soon as opportunity offered, the explanation which Mr. Darlington might be able to give them. The conduct of the directors had been variously criticised. A direct complaint had been addressed to the board—that they detained the report after it was presented to them; he could only say there was no ground whatever for such a statement. As soon as the report came the directors sent it out to the shareholders, but by a mere clerical error the report was dated a month earlier than its real date, and possibly that might have given rise to the suggestion. It was a long and elaborate report, and necessary to be read first at a board meeting, and the directors determined, without comment upon their part, to send it just as it was to the shareholders. There had been another complaint, and it had been stated that it should not have been sent out at all, as it was a report for the information of the board and their guidance, and it was unnecessary to cause disquietude, disturbance, and excitement by sending it to the shareholders. That, however, was not the view of the board, who held that having received the report, it should be sent. It had been the rule, at any rate since he had been a director, never to withhold anything from the shareholders; whatever the board had known the shareholders had known, and acting upon that rule, and consistently with it, the board deemed it their duty to send the report to the shareholders, and possess them of all the information which the directors themselves had. (Cheers.) He did not hesitate to say that the report had been received by the board with very great gravity. He himself certainly had not been able to treat it lightly; it had made an impression upon the minds of the directors which they were not prepared for, and he did not wonder that it had also been received with gravity, with disquiet, and with some alarm by the shareholders. It had also caused a depression of the shares, and some alarm as to the future, which he thought were not justified. In some respects the construction which had been put upon Mr. Darlington's report, as he gathered from a variety of sources, was not the construction which Mr. Darlington contemplated, or thought it would bear. He (the Chairman) did not pretend to mining knowledge, except that which, as a conscientious director, anxious to perform his duties properly, he had picked up since he had been on the board, but he hoped Mr. Darlington was present, and would be glad to answer any enquiries, and he should not hesitate to repeat that this report had in some very important particulars been misunderstood. The report was accompanied by diagrams, prepared by Mr. Darlington, for the better understanding of the subject he had to report upon, and one of those diagrams contained a rectangle, at the base of which was shown the present workings of the company, and some of the shareholders concluded when they received this that it contained a representation of the limits of the mining property, and also thought that when Mr. Darlington went on to describe the quantities of ore which were contained within the rectangle, he was describing the extent of the ore which might exist throughout the whole lode. He believed Mr. Darlington would agree that no greater mistake could, by any possibility, be made. Now, Mr. Darlington never intended to convey the idea that that rectangle comprised the whole extent of the company's mineral property; on the contrary, in the portion which was now being worked on Mr. Darlington spoke of the ore in reserves, and spoke of 10,000 tons of ruby ore, and

70,000 tons of yellow ore, but some of the shareholders seemed to imagine that Mr. Darlington intended to imply that there was nothing left in the lode but these ores. In that Mr. Darlington had been mistaken, and he did say that there was, in the present workings all which could be seen or estimated were about 10,000 tons of ruby ore and 70,000 tons of yellow and inferior ore. (Hear, hear.) If the shareholders would look at the map they would see a black patch upon the Aroa lode; that black patch represented the extent of the present workings, and they would see how small a proportion that bore to the entire length of ground between Titirani and Aroa. Probably there was one continuous lode, but as to that he expressed no decided opinion, but the Aroa lode was at least five or six times as large as the space which comprised the present working; indeed, the space within which the present workings were limited was small in comparison with the extent of the property. However, he would leave the shareholders to elucidate by questions a fuller explanation of the matter. He was satisfied, and his colleagues were satisfied, that the property had been very carefully examined by Mr. Darlington, and they had had a very conscientious report from that gentleman, in which the main idea had been not to exaggerate the property, or to indulge in any illusory notions as to its value, but in his desire and effort to do this Mr. Darlington probably refrained from expressions which might have relieved apprehensions which he (the Chairman) had been endeavouring to correct. He did not, however, pretend to say that this report was no disappointment to him; it was a disappointment to the board, and the facts reported were disappointing. It was disappointing, for instance, to find that the ruby ore was not of the richness which was at one time supposed, and also to find that the yellow ore, instead of being 20 per cent. (as the board were over and over again assured), was only something like 10 per cent. This was extremely disappointing, because previous to Mr. Darlington's report all the reports which had been received as to the extent and value of the ore had been uniformly flattering. There had never been a period in which the board had not had flattering reports as to the extent and value of the ore; and whatever weakness the company might be supposed to have with respect to getting the ore from the mine, the unhealthy condition of the country, the difficulties of the climate, and physical difficulties, whatever the circumstances of danger and doubt, no one ever suggested that the non-existence of ore was amongst the dangers; on the contrary, the board firmly believed, and he did not hesitate to say still believed—(hear, hear)—that they had an almost inexhaustible reserve of minerals in the lode, and that all that was necessary was that they should open the lode, and get the minerals to the market. (Cheers.) As to the ruby ore, there were about 2000 tons raised altogether. He believed he was correct in thinking that the mass of the shareholders supposed that ruby ore was to be got out of the Ruby Saloons; that was not so, for all that had been sent down had been got out of a place at the Santa Catalina level, called the German workings, and that was almost an accidental discovery by a former superintendent, who in opening that level came upon a shoot of ore, and from that shoot there had been extracted 200 tons of fairly good ruby ore. There was every reason to believe that the ruby ore was just as likely to be found in other parts of the mine in patches as in the cross-cut.

A SHAREHOLDER: What is the percentage of the ruby ore?  
The CHAIRMAN said that the percentage of the ore from the cross-cut east would be about 17. He dare say that to the minds of the shareholders had occurred the enquiry how they were going to carry on the works; such exploratory works as Mr. Darlington had suggested to be entered upon. He thought it was right to say at once that he was not prepared at that moment to answer that question. Thus far they had not had financial difficulties, nor were financial difficulties pressing upon them at the present moment, but it was obvious that some arrangement would have to be submitted for the consideration of the Bolivar Railway Company, or the financial friends to whom this company as well as the Bolivar Company had hitherto resorted in their need, and there was every reason to believe it would not be necessary to trouble the shareholders on the subject of the company's financial needs. (Cheers.) At any rate he strongly advised that that question should not to-day be entered upon. He would ask the shareholders to accept his assurance that if any occasion for it arose—that was to say, any case at all involving property or altering the basis of existing arrangements—the shareholders would be immediately consulted on the subject, and he trusted the shareholders would be satisfied with that assurance, and leave negotiations of that delicate kind to the discretion of the directors. (Cheers.) In conclusion, the Chairman formerly moved the adoption of the report and accounts.

Mr. F. H. HEMMING (deputy-chairman) seconded the resolution.  
Mr. F. H. HEMMING said he was pleased to hear what the Chairman had said, but he should like to have heard a little more as to the policy which the directors intended to pursue in working the property. The principal part of Mr. Darlington's report referred to future expenditure. It appeared that the company possessed an immense lode, and as a practical man it seemed to him that instead of sinking shafts into the ground it would be better to continue on the lode which they had already commenced, and make cross-cuts a certain number of fathoms apart, and as they had fine rich ore at the commencement why should they not have the same class of ore further on?

Mr. DARLINGTON said the company was actually carrying out the works which the honourable shareholder suggested. He explained the different features of the mine by means of a map, and said the general design was to push the lower galleries into fresh parts of the mine in hopes of securing fresh ore, and also for the purposes of ventilation; moreover, to extend the galleries from the upper part of the mine. It has also been suggested that in order to get under the present ore and to prove the lode in entirely new ground a deep level should be put in some 1450 ft. to the north of the present workings.

In answer to Mr. HEMMING, who asked why they should not take out at once the whole of the ruby ore, and thus provide capital, Mr. DARLINGTON pointed out that it would be necessary to take away all the ore at once, but it was necessary to push on exploratory works, with the view of finding larger quantities of ore, so as to endeavour to meet the requirements of the contract with the railway company.

Mr. WARD said it was ungracious to criticise gentlemen who had worked so hard as the board, but there were two or three questions he should like to ask in a friendly spirit. Why had not the shareholders heard before of the facts now stated in Mr. Darlington's report? The shareholders had been living in a sort of fool's paradise; they had been told that the ore was of a high grade, and now it had come down to 17 per cent. and less. He asked for information regarding the suggestion of amalgamation with the Bolivar Company. One company was so dependent upon the other that for his own part he thought such amalgamation was desirable, but at the same time he hoped the board would not make any sacrifice in dealing with the Bolivar Company. He understood the Bolivar Company was carrying out its contract, but he presumed it was not the contract which required this company to deliver 50,000 tons of ore a year. He hoped the shareholders might be justified in looking forward to a brilliant future.

A SHAREHOLDER said he hoped the board would develop the works they had in hand, and would take a fair share of the money in hand to do so with.  
A SHAREHOLDER asked how it was that so much apparently worthless ore had been sent home?—A SHAREHOLDER said it was no use talking about the past, but must make the best they could of what they had in hand. Why not smelt the ore over there and then send it home—it would save freight?

Mr. LANCASTER asked whether it was true that Mr. Downes was in the pay of the railway company, and also this company. Referring to the directors' expenses, he said he thought the board should give their services for nothing.

The CHAIRMAN said that he would only remark on this subject that there was not one director who would not make a profit by resigning his office, and certainly he himself should have done so before now (because it had been a positive loss to him), but he had felt a pride and ambition to realise during his term of office some of the anticipations which had been held out with regard to this property. (Cheers.) Mr. Downes was joint agent of the two companies. So much had to be done by the two companies which required harmonious co-operation that it was highly necessary to have one person appointed in that capacity, and Mr. Downes was originally divided between the two companies. At the time that arrangement was made he was not a shareholder, who was satisfied that it was wise and desirable. With regard to the directors' salaries, they were not yet bound by contract for 20,000 tons per annum; it was not to begin to run against the company until the railway was completed, and it was further provided that if the company desired it all the ore that was delivered till the railway company was completed should be taken as on account of the first year's delivery. A question was asked how it was that the first cargoes came to be so much better than the last? The first cargo was 19½ per cent.; the second, 20½ per cent.; the third, 13½ per cent.; the fourth, 12½ per cent.; and the whole taken from the German workings at the cross-cut east. The instance sent out with regard to the ore were not to send home rubbish, but a fair sample of the better ore, but how it came that one was 20 per cent. and another 13 per cent. he could not say. Probably since the railway was opened to La Luz there was not the same necessity to sort the ore as there was when it had to be conveyed a long distance on the backs of mules and donkeys. The lowest ore which had arrived in England was 13 per cent. There had been a variety of criticisms, all perfectly fair, but it was easier to criticise than to answer criticism, and he wished that those gentlemen who criticised should themselves come upon the scene.

The directors were asked why the information given in Mr. Darlington's report was not known before. The hon. gentleman who put the question had been a shareholder many years, and why did he not suggest that the company should go to the expense of engaging a special engineer to be sent out to report upon that which everyone took for granted, and with regard to which the directors had only had one kind of evidence, and all agreeing as to the value of these ores. (Hear.) The directors had not acted without evidence; they might have been misled, but if so he believed it had been unintentionally and inadvertently. He had by him extracts from letters and reports which had been received by the board ever since he became a director, all speaking highly of the property. They engaged Mr. Richardson as mining superintendent at 1200l. a year, and under date of January 29, 1876, that gentleman wrote that the company had a magnificent property, quite sufficient to keep the railway going, and that the working faces were really wonderful. He had by him a great number of extracts, all of which spoke of the inexhaustible richness of the mine. If this company had been mistaken, it had been mistaken in common with the Bolivar Company, for was it to be supposed that that company had risked hundreds of thousands of pounds without making proper enquiry? (Cheers.) Then, again, look at the report made at the last meeting by Mr. Vincent. Why, with such reports, the shareholders would have said the directors were wasting the money of the company if they had sent out a special engineer to report upon that which no one entertained a doubt about—the extent and value of the ores. (Hear, hear.) As regarded the amalgamation, that was a subject upon which neither company was yet ready for action. The Bolivar Company said, half a year ago, "Let us know what you have to sell," which was a wise and proper answer. The Bolivar Company must buy this company, and this company must buy the Bolivar, and had no power to do so. He was afraid that, at this moment, the notions of the two companies were too divergent to admit of their coming together. As to the desirability of such an amalgamation he did not think there could be two opinions. (Cheers.) He believed there should be an amalgamation for the sake of economy in expenditure and harmonious working, and also with the view to the readjustment and reconstruction of the cost of carriage. The time would come when this must be gone into thoroughly. There were certain legal difficulties in the way, but the shareholders might accept the assurance that nothing would be done to commit them, without everything being submitted for their approval. He might mention that there had been no loss upon any one cargo of ore sent to this country.

Mr. DARLINGTON, in answer to a further observation, said that when in Venezuela he obtained the fullest information with regard to all the mines, and, referring to his report, pointed out certain recommendations which he had made with respect to the future working of the property.

The CHAIRMAN: Is there any reason whatever to think, and is it within the range of probability or possibility, that our mineral treasures can be confined to the present workings?—Mr. DARLINGTON: Not at all; there is no reason why, by continuing exploratory works, you should not discover other shoots of both yellow and ruby ore.

Mr. DARLINGTON, in reply to a further question, said he thought the ore should be concentrated to 25 or 30 per cent. before it was sent over.

The resolution was then put, and carried.  
Mr. HEMMING said he could state, with all sincerity, that his opinion as to the result was totally unchanged, and that the present state of things was only temporary. A vote of thanks was then passed to the Chairman and directors.  
A vote of thanks was also passed to Mr. Darlington for his conscientious report, and the meeting broke up.

## ST. JOHN DEL REY MINING COMPANY.

The annual meeting of proprietors was held at the City Terminus Hotel, Cannon-street, on Wednesday.

Mr. JOHN HOCKIN (managing director) in the chair.  
The CHAIRMAN having read the notice convening the meeting read the minutes of the previous meeting, which were confirmed. The report and accounts were taken as read.

The CHAIRMAN said—This report which is now presented to you is the 25th annual report to which I have had the honour to affix my name. At the expiration of this year I shall have served you just a quarter of a century. During that long period—long in the history of a mining company, though this company has existed nearly double that period—we have had many years of prosperity, some of adversity, but, on the whole, it has been a period of marked success, the best proof of which is that during that period we have distributed in dividends nearly one million sterling—the exact figure are 979,577l., but taking in the reserve, accumulated from realised profits, the whole exceeds 1,000,000l. sterling, which is equal to 30 per cent. per annum on the originally subscribed capital of the company for the whole period. In commenting on this report the first figures that I have to deal with are those at page 8, which show the produce of gold during this and the two preceding years. We much regret that there has been so great a difference between this and last year's produce, for it has always been the policy of the directors to endeavour to keep the produce and the dividends—which of course follow the produce—from fluctuating, as far as is possible in a mining company. Circumstances of an exceptional character have, however, combined, and have resulted in an unduly large produce last year, and an equally short produce during many months of the present year. These circumstances have been and are still being enquired into by the directors, but they have not the whole of the evidence sufficiently before them to enable them to come to a final decision in the matter. Though we have quarried rather more mineral this year than last, we have only sunk the sump, or deepened the mine, a little more than half as much as we did last year and the year before. This will account for the lower average yield of mineral stamped—7043 oits. per ton this year, against 9638 oits. per ton last year, for the ore from the sump and the immediate neighbourhood of the sump is purer and less mixed with poorer stone than in the extreme ends of the mine, particularly the western end. The cost appears in the account to be less than last year, but that is owing to a more favourable rate of exchange, for the cost in currency is rather more than last year, the increase being chiefly in labour. In the directors' reports presented to the proprietors at the last two meetings they have remarked on the loss of gold in treatment, and have stated that they were making efforts to reduce the same. During the past year I regret to say that I fear we have not made any progress, but we hope we have advanced one step in the right direction, which is that we have gained a more accurate knowledge of what the loss really is than we possessed during the two preceding years. The assays, we believe, have been more accurately made at the mines, and the results approximate more nearly than at first the results shown by the assays made in London of the duplicate samples. We estimate the loss sustained during the year at not less than 2½ oits. per ton of ore stamped, which is just 5 pennyweights 18 grains per ton. Now, we do not suppose that with the most perfect system of treatment we can recover the whole of this gold, but we confidently hope that by more careful treatment we may recover a considerable portion of it; one-half only would add considerably to your dividend, being equal to 12 per cent. on the capital of the company, and in this hope we intend during this year to endeavour to establish, in the first place, a more careful working of the existing mode of treatment; and, secondly, by the erection of simple machinery to improve the present very rude mode of treating the refuse sand or tailings. Since we issued the report we have received the concluding portion of the superintendent's general observations, which contains an account of a personal inspection of the mine on May 17 last. You have a copy of it in your hands, as received from the printers this morning, and you will observe that it enters into many minute details as to the condition of the mine which are of general interest. The concluding portions are, however, particularly so. Beginning at page 14, line 11 from the bottom, the superintendent enters on a comparison of the size and value of the lode in the present excavation with its dimensions and quality in the old mine, just before its destruction, in the following words:—"The closest horizon at which we can institute a comparison between the bunch part of the Bahu and the western part of the Cachoeira Mine, which embraces the precise limits we contemplated working when the re-opening of the mine was determined on, would be found at the bottom of the mines at the end of 1866. If the section above stated be taken at the end of 1866, its mineral dimensions be carefully computed, due allowance made for proportions of killas in the line of what was called the 'bar,' and in the West Cachoeira, it will, I apprehend, be found that so far as we have gone on our present mineral section we have not fallen very much short of extracting an equivalent body of mineral, bearing fairly the same proportionate auriferous contents as was raised in any similar section in the excavation near the bottom of the old mine. It should also be kept in view that we have a good-sized comparatively clean body of mineral standing in the east of our present excavation which can be quarried cheaply, and will no doubt yield good produce, as has been already proved. Taking a deliberate view of the mineral formation fixed on for working, when the re-opening of the mineral formation was determined on, and keeping in view the cubic contents of that section, so far as we know they are yet opened to our examination, and also bearing in mind its auriferous contents as far as they are ascertained, and have been proved, it does not appear to me there is any ground for anxiety respecting the size, productiveness, or profitable character of the mineral section of the formation, which is now being worked by the company. I cannot see any ground for doubt or anxiety, nor do I perceive the least solid reason to change the opinion distinctly expressed in previous observations, that the mineral section being worked is capable of giving large, steady dividends to its proprietors."

The sketch of the size of the lode on May 15 is on the table, for the inspection of any proprietor who desires it, and the other sketches alluded to in the last part of the appendix, marked No. 2, may now be seen and examined on application at the office. In regard to finance, the figures are, I think, pretty clearly given in the report. We have cash in hand to pay the dividend and all liabilities this month, besides having 5800l. invested in railway debenture stock, and there is a remittance due next month of about 30,000l. And as to the reserved fund, we have already a very handsome sum accumulated—actual reserved fund, 43,800l., and 14,000l. of unexpended capital, making altogether 57,800l., all invested in first-rate securities, available for any emergency. We know in this company how important it is to have a strong reserve, and we hope to go on increasing it till it reaches at least 100,000l. In the report we inform you that we have deemed it our duty in the interests of the proprietors to send out a commission of enquiry to Morro Velho. The result of that enquiry we have not fully before us, and shall not have for some time, but I regret extremely to say that from information already received they have come to the conclusion that the superintendent at Morro Velho, who had been so long in your service, and who in times past has done good service, is no longer equal to the charge, and we have, therefore, felt it our painful duty to terminate his agreement. Mr. Pearson Morrison has been appointed superintendent provisionally in his stead. With these few remarks, gentlemen, I now put the resolution, and will then give an opportunity of answering any questions which any gentleman may like to ask—"That the report and accounts presented to this meeting be received and adopted."

Mr. W. W. BRAND said perhaps the Chairman would be good enough to state what precautionary measures had been taken to prevent a recurrence of what had already taken place at Morro Velho, and whether it was contemplated that one of

the directors should be sent to Morro Velho to see that the superintendent was properly supervised.

The CHAIRMAN said that he would only remark on this subject that there was not one director who would not make a profit by resigning his office, and certainly he himself should have done so before now (because it had been a positive loss to him), but he had felt a pride and ambition to realise during his term of office some of the anticipations which had been held out with regard to this property. (Cheers.) Mr. Downes was joint agent of the two companies. So much had to be done by the two companies which required harmonious co-operation that it was highly necessary to have one person appointed in that capacity, and Mr. Downes was originally divided between the two companies. At the time that arrangement was made he was not a shareholder, who was satisfied that it was wise and desirable. With regard to the directors' salaries, they were not yet bound by contract for 20,000 tons per annum; it was not to begin to run against the company until the railway was completed, and it was further provided that if the company desired it all the ore that was delivered till the railway company was completed should be taken as on account of the first year's delivery. A question was asked how it was that the first cargoes came to be so much better than the last? The first cargo was 19½ per cent.; the second, 20½ per cent.; the third, 13½ per cent.; the fourth, 12½ per cent.; and the whole taken from the German workings at the cross-cut east. The instance sent out with regard to the ore were not to send home rubbish, but a fair sample of the better ore, but how it came that one was 20 per cent. and another 13 per cent. he could not say. Probably since the railway was opened to La Luz there was not the same necessity to sort the ore as there was when it had to be conveyed a long distance on the backs of mules and donkeys. The lowest ore which had arrived in England was 13 per cent. There had been a variety of criticisms, all perfectly fair, but it was easier to criticise than to answer criticism, and he wished that those gentlemen who criticised should themselves come upon the scene.

The directors were asked why the information given in Mr. Darlington's report was not known before. The hon. gentleman who put the question had been a shareholder many years, and why did he not suggest that the company should go to the expense of engaging a special engineer to be sent out to report upon that which everyone took for granted, and with regard to which the directors had only had one kind of evidence, and all agreeing as to the value of these ores. (Hear.) The directors had not acted without evidence; they might have been misled, but if so he believed it had been unintentionally and inadvertently. He had by him extracts from letters and reports which had been received by the board ever since he became a director, all speaking highly of the property. They engaged Mr. Richardson as mining superintendent at 1200l. a year, and under date of January 29, 1876, that gentleman wrote that the company had a magnificent property, quite sufficient to keep the railway going, and that the working faces were really wonderful. He had by him a great number of extracts, all of which spoke of the inexhaustible richness of the mine. If this company had been mistaken, it had been mistaken in common with the Bolivar Company, for was it to be supposed that that company had risked hundreds of thousands of pounds without making proper enquiry? (Cheers.) Then, again, look at the report made at the last meeting by Mr. Vincent. Why, with such reports, the shareholders would have said the directors were wasting the money of the company if they had sent out a special engineer to report upon that which no one entertained a doubt about—the extent and value of the ores. (Hear, hear.) As regarded the amalgamation, that was a subject upon which neither company was yet ready for action. The Bolivar Company said, half a year ago, "Let us know what you have to sell," which was a wise and proper answer. The Bolivar Company must buy this company, and this company must buy the Bolivar, and had no power to do so. He was afraid that, at this moment, the notions of the two companies were too divergent to admit of their coming together. As to the desirability of such an amalgamation he did not think there could be two opinions. (Cheers.) He believed there should be an amalgamation for the sake of economy in expenditure and harmonious working, and also with the view to the readjustment and reconstruction of the cost of carriage. The time would come when this must be gone into thoroughly. There were certain legal difficulties in the way, but the shareholders might accept the assurance that nothing would be done to commit them, without everything being submitted for their approval. He might mention that there had been no loss upon any one cargo of ore sent to this country.

Mr. DARLINGTON, in answer to a further observation, said that when in Venezuela he obtained the fullest information with regard to all the mines, and, referring to his report, pointed out certain recommendations which he had made with respect to the future working of the property.

The CHAIRMAN: Is there any reason whatever to think, and is it within the range of probability or possibility, that our mineral treasures can be confined to the present workings?—Mr. DARLINGTON: Not at all; there is no reason why, by continuing exploratory works, you should not discover other shoots of both yellow and ruby ore.

Mr. DARLINGTON, in answer to a further observation, said that when in Venezuela he obtained the fullest information with regard to all the mines, and, referring to his report, pointed out certain recommendations which he had made with respect to the future working of the property.

The CHAIRMAN: Is there any reason whatever to think, and is it within the range of probability or possibility, that our mineral treasures can be confined to the present workings?—Mr. DARLINGTON: Not at all; there is no reason why, by continuing exploratory works, you should not discover other shoots of both yellow and ruby ore.

Mr. DARLINGTON, in answer to a further observation, said that when in Venezuela he obtained the fullest information with regard to all the mines, and, referring to his report, pointed out certain recommendations which he had made with respect to the future working of the property.

The CHAIRMAN: Is there any reason whatever to think, and is it within the range of probability or possibility, that our mineral treasures can be confined to the present workings?—Mr. DARLINGTON: Not at all; there is no reason why, by continuing exploratory works, you should not discover other shoots of both yellow and ruby ore.



the directors, or a properly appointed person, should go out to the mine periodically to ascertain the true and satisfactory state of the mine, or whether the company was to be left to the discretion of any such person as had lately taken place. Of course, in addressing these remarks he begged to state emphatically—and he had no doubt it was the opinion of every gentleman present—his belief that the management of their directors was the very best which could be obtained in London (hear, hear)—particularly with respect to the managing director. (Hear, hear.) He believed he was only echoing the feelings of every gentleman present when he said that their managing director was one of the most able men for the post he occupied to be found in London. (Hear, hear.) It was, however, imperatively necessary that the company should be placed in such a position that its interests were not likely to suffer from deficiency of knowledge of what occurred at the mines. It would be unbecoming on his part to make any suggestion as to what steps the directors should take, and he simply made these remarks as a petition.

Another SHAREHOLDER suggested that while the manager or superintendent sent to Morro Velho should be a man of undoubted character he should find proper securities for his general good conduct.

The CHAIRMAN in reply said he could assure the shareholders that no manager or superintendent would be allowed to remain at Morro Velho for any lengthened period without his being looked up occasionally, and with regard to the security of the present manager in his agreement with the company was under a penalty of 1000*l.* in case of any maladministration of his office.

The report and accounts were unanimously adopted.

The CHAIRMAN then proposed the declaration of a dividend of 17½ per cent. on the capital stock of the company, to be paid free of income tax on and after the 28th inst.—The proposition was carried.

The CHAIRMAN moved the re-election of Mr. R. S. Illingworth, one of the directors getting by rotation.—The motion was carried.

The CHAIRMAN moved the re-election of Mr. Frederick Tendon as a director of the company. Mr. Tendon had very handsomely, when it was necessary that some one should go out to the mine, given his services to the company without any remuneration; though that was not the best part of it, for he would obtain such a knowledge of the affairs of the company as would be very useful to the board on his return. It had, therefore, much pleasure in moving the re-election of Mr. Tendon.—The motion was carried.

The CHAIRMAN then proposed the re-election of Mr. Spencer Herapath as auditor of the company, and the proposition having been adopted, he (the Chairman) said the other auditorship was vacant in consequence of the election on the board of Mr. Tendon, who had previously acted as an auditor of the company.

A SHAREHOLDER proposed, and another SHAREHOLDER seconded, the election of Sir John Swinburne, Bart., as auditor, remarking that Sir John was not only a thorough man of business and an old shareholder in the company, but that he had had considerable experience in one of the largest mining districts in England, and was himself the owner of a gold mine in South Africa.

The CHAIRMAN, in reply to a shareholder, stated that the company's regulations provided that there should be two auditors, and that both should hold not less than 400*l.* stock of the company.—The motion for electing Sir John Swinburne as auditor having been carried, that gentleman briefly thanked the shareholders for the confidence they had reposed in him in electing him an auditor of the company.

A SHAREHOLDER said the meeting could not separate without tendering their best thanks to the directors of the company, and to the Chairman in particular. He was sure they must all be satisfied that the vast interests of the company were attended to assiduously, in every respect by the directors.

The motion having been seconded, was carried *non des.*

The CHAIRMAN briefly returned thanks for the compliment, and the meeting then closed.

#### PLYNLMON LEAD MINING COMPANY.

An extraordinary general meeting of shareholders was held at the offices of the company, Austinfrans, on Tuesday, Mr. E. W. WINGROVE in the chair.

The SECRETARY read the notice convening the meeting, which stated that it was called for the purpose of considering the propriety of winding up the undertaking.

The following report was read:—

June 25.—Agreeable with your request I beg leave to submit the following report on the above-named mine for the general meeting to be held to-morrow:—The underground operations for the year have been as under:—Sinking the new shaft below the 24 fm. level 1 fm. 3 ft. Driving the 24, east of new winze, 25 fms. 5 ft. 9 in. Driving drifts, east of new winze, 5 fms. Sinking Jones' mine below the 24 fm. level 5 ft. 3 in. Sinking Herbert's winze below the 24 fm. level 8 fms. 3 ft. 6 in. Stopping the back of the 24, east of new winze, 23 fms. 4 ft. Stopping the bottom of the 12, east of cross course, 42 fms. 5 ft. 8 in.—Total ground worked 317 fms. 0 ft. 6 in. The number of fathoms of ground worked in your mines during the past year was 317, from which 181 tons of lead ore have been sold, realising 2550*l.* 17s., giving an average of 14*l.* 10s. per ton.—New Shaft: In connection with this shaft a line of pulley stands, and horizontal rods have been erected 430 fms. in length, extending from the pumping-wheel through the adit level to the new shaft, and a 6-inch main rod has been fixed, and also a 6-inch drawing line, and sinking to a 36 fm. level, resumed recently; this shaft is now down 12 fms. 3 ft., the required depth. We propose sinking another 3 ft. for a fork for the accumulation of water in necessary cases of slight stoppages in changing buckets, &c. The lode in the present bottom is of a very promising character, it being composed of killas, calciferous, blende, munda, and occasional stones of lead ore; the almost total disappearance of the munda in the matrices of the lode is, in my opinion, very favourable indeed to the production of lead ore in depth. A 36 fm. level will be started east of this shaft in another week. I would here remark that there will be no danger of water in future, in view of the recently deepening this shaft. During the first ten months embraced by this report the 24 was extended east of new winze 25 fms. 5 ft. 9 in., the first 7 fms. of which was in a lode composed of killas, munda, and lead ore, producing of the latter from 1 to 3 tons per fathom; when the lode was heaved out of its course to the north, which impoverished it for the next 5 fms., when it again became productive for about 14 fms. in length, averaging a yield of 2 tons of lead ore per fathom when it reached the extremity of the ore ground, and was consequently suspended.

For the future of the mine at deeper levels it is encouraging to see that the productive ground has lengthened eastward 7 fms. between the 12 and the 24. The total length of productive ground passed through by this level, east of new winze (deducting the poor bar, 5 fms.) is 30 fms. 5 ft. 9 in., which will be in the sole of the level average a yield of 2 tons of lead ore per fathom; this is standing intact for the whole length. The sinking of a winze (Jones') below the 24, about 20 fms. east of new shaft, was commenced in February last, which for the first 3 fms. was sunk off the lode, which when cut into was found to be large, composed of calciferous spar, quartz, blende, munda, yellow copper and lead ore, and which in a short time improved to a produce of 16 cwt. of lead ore per fathom. Since then, owing to occasional changes in the underlie, its yield has fluctuated from 10 to 15 tons of lead ore per fathom. In the present bottom the lode presents a promising appearance, and is producing saving work for dressing floors. The presence of copper at this point in the lode is an addition to its components in the upper level. At a point about 35 fms. east of last named winze, or 55 fms. east of new shaft, the sinking of Herbert's winze below the 24 also commenced in February last. This winze also struck the lode in about 3½ fms., which when cut into was found to be 2 ft. wide, composed of killas, blende, munda, and lead ore, of the latter ½ ton per fathom, rapidly improving to a yield of 1½ ton per fathom, about 6 fms. in depth the lode has been discovered by a branch dropping into it from the north side, which caused the lode to decline in value to ½ ton of lead ore per fathom, its present value. I may here add that this winze is situated about 5 fms. west of western cross-course shown in section, which has been the point east of which the eastern run of ore ground has commenced in the upper workings. I have reason to believe that there is another, and probably a richer, part of the lode standing in the south side of this winze, and have instructed the men to gradually gain a little in that direction to prove it. These winzes are down respectively 8 fms. 3 ft. 6 in. and 8 fms. 3 ft. 6 in., and are being pushed on as fast as possible by a full complement of men in each, but, owing to the water being quick, progress is slower than I desire. I hope with continuous working to get them down the required depth—1½ fms.—in about six weeks from date.

During the past year a considerable quantity of ground has been stoped over the 24, but owing to numerous cross channels of ground causing splines in the lode it has not yielded equal to promise held out by the level. We have at present in operation two stopes, one by six men, working a goodly amount of ground, and the other stopes, situated in advance of the last named, is being worked by 10 men, in which the lode varies in produce from 20 to 25 cwt. of lead ore per fathom.—Future Exploratory Operations: For the speedy development of the resources of the mine at a deeper level the 36 should be driven east of the new shaft, Jones' and Herbert's winzes sunk as rapidly as possible to the required depth, and levels extended both east and west from the same, and immediately a communication is effected by the 36 east with Jones' winze preparations for sinking a new shaft to a 48 fm. level should be made at once. By steadily persevering in this mode of operation, the taking as a basis the ore ground passed through in the 24, both between Hughes' and the new winzes, and east of the new winze to the end of the 24, the following results may reasonably be expected. The 36 east, between Jones' and Herbert's winzes, at a moderate estimate, should open a length of 20 fathoms of ore ground, or a total of 220 fms. of stoping ground, at a yield of 1 ton of ore per fathom, equal to 220 tons. The same level, east of Herbert's winze, should also lay open a section of stoping ground, 30 fathoms long by 11 fathoms high, or 330 fathoms, at an estimated yield of 2 tons of lead ore per fathom, equal to 660 tons, giving an estimated total of 880 tons of lead ore. I may further add that, although I do not ensure that this result will be obtained, I am fully justified in coming to this conclusion, my calculations being based entirely on the value of the lode gone down in the bottom of the 24 fm. level. I have also reason to believe that in this and deeper levels the ores will be more argentiferous, and consequently realise a higher price in the market. This has been the rule and not the exception in the mines of this country.

At surface, during the past year we have had almost a continual supply of surface water, hence but little has been done towards completing the raising of the embankment of the reservoir, but at any time in cases of drought, &c., when the men are prevented from working below, they should be employed at this very necessary work, which, when completed, will (with the exception of a very long drought) give a ample water for all purposes.

In conclusion, I am pleased to say that I conscientiously consider the prospects of the mine to be very encouraging indeed, and sincerely trust that the next few months' operations will prove that my estimate of probable results obtainable are not in any way exaggerated; in the meantime, every economy shall be studied consistent with the advantageous development thereof. The machinery throughout is in an efficient state, and, barring the need of a few slight repairs, which will be attended to in due course, is in fair working order. Since the delivery of the last parcel of ore sold, drawing and dressing have been kept on steadily, and with a little additional surface water we shall again soon be in a position to sample another 20 tons of lead ore. I shall be happy to furnish you with any other particulars you may require.—JOHN GARLAND.

The following report has been received since the meeting:—

June 27.—There is not any change calling for remark in any of our underground operations since date of report for the general meeting. Nothing has been done in new shaft this week owing to scarcity of surface water to keep the pumping-wheel going. Yesterday we had some heavy rain, which has given us a good supply, our reservoir being full. I hope to get the water drained against to-morrow, when sinking will be resumed. We have also recommenced drawing and dressing.—J. GARLAND.

The CHAIRMAN said the shareholders might possibly feel somewhat

surprised at the receipt of a notice to wind up the company in view of the facts that they had a balance of assets of about 1500*l.*, and that the reports on the property from the manager were exceedingly favourable. The meeting had been called after much anxious deliberation on the part of the board, in conjunction with the London manager, and the directors had arrived at the conclusion that unless a more vigorous system of working the mine were adopted, which could only be attained by the application of sufficient funds at once, the hopes of the remunerative results, which the appearance of the mine fully justified, would be materially lessened, as at present it was simply working from "hand to mouth," and although the returns—so long as neither drought nor frost prevented driving operations—nearly met the current expenditure, yet a stoppage at any time, either in summer or winter, would throw these back, and the loss could only be met by an unremunerative expenditure of the remaining limited capital. The board considered that the highly promising indications which had been referred to in detail in the report of Capt. Garland, received to-day, and which had just been read, should encourage the present shareholders to subscribe for the remaining 1000 unissued shares; but that, failing this, an opportunity should be given to those shareholders who were willing to carry on the enterprise vigorously to become possessed of the property, it being obviously unjust that 70 only out of 300 shareholders who had subscribed should be looked to for finding capital to work the mine properly. As, however, the attendance was so small on the present occasion he (the Chairman) would propose that the meeting should be adjourned to that day fortnight, at the same hour. In the meantime, Captain Garland's report would be circulated, and a circular would be issued by the board again drawing the attention of the shareholders to the necessity of obtaining further capital.

After a short discussion, the meeting was adjourned to July 10, in accordance with the recommendation of the Chairman.

The proceedings terminated with the usual compliments.

#### GUNNISLAKE (CLITTERS) MINING COMPANY.

A four-monthly meeting of adventurers was held on Tuesday at the mine, Mr. J. C. ISAAC, of Liskeard, presiding. The accounts showed a profit on the four months' working of 181*l.* 2s. 6d. A balance of 85*l.* 13s. 7d. was brought forward from the last account, so that there is now a credit balance of 1040*l.* 16s. 1d. It was not proposed to declare any dividend.

The CHAIRMAN, referring to remarks in the agent's report, with respect to the necessity of extending the dressing-floors, said this subject had been under the consideration of the committee for some time. They were aware that as the mine had become more largely developed alterations would be necessary. They had, therefore, instructed the agents, with Mr. Matthews, their engineer, to inspect some of the recent improved machinery for dressing erected in different parts of the country, and they reported most favourably of certain machinery they had seen at work, and its applicability to Gunnislake (Clitters), which if erected would secure a very considerable monthly saving. The sanction of the shareholders, however, would be required for any outlay that may be made, supposing it was decided that the necessary machinery should be provided.

Mr. MATTHEWS, the engineer, stated that the agents and he had been into Cornwall and North and South Wales. They had visited Great Darton, East Darton, and Van Mines, and brought with them samples of the stuff which was dressed by the machinery they used. They were greatly struck by the excellent way in which the jiggling machines did their work, and he was convinced that if they adopted the same mode of dressing at Gunnislake (Clitters) they would effect a saving of at least 50 per cent. in the dressing cost.

Mr. JAMES PEARCE asked whether this improved machinery would admit of the treatment of copper as it did of lead.—Mr. MATTHEWS said he believed it would; it had been tried elsewhere, and proved very successful. If they went over to Devon Great Consols they would see the same kind of jiggers dressing the halvans, which contained about 1½ per cent. for copper, and it was being dressed at a very good profit.

Capt. SKELVIS explained that the process of jiggling was precisely the same in the case of copper as it was with lead. They would find with copper, as with lead, that every now and then they would have heavy stubborn waste, such as munda, hard capels, and so on, and he knew that in Wales a great many mines laboured under considerable difficulties in consequence of the enormous quantity of sulphuric munda and blende that existed with their lead, and which rendered it almost impossible for hand labour to separate so as to make it of value. The introduction of these jiggling machines had proved beyond all doubt that sulphuric munda, blende, and copper were separated in the most perfect manner, besides which they got rid of their waste, heavy and stubborn though it might be, far more effectually than under the old system. In Gunnislake Clitters their waste was not of a stubborn character, and he believed that the suitability of jiggling machinery to their mine could not be questioned for a single moment by those who had any practical knowledge of the subject. In his opinion it would prove to be all that could be desired, and that it would be worked with very great success.

Mr. PEARCE wished it to be understood that he was not all opposed to the introduction of this machinery, but he thought they ought to be first convinced as to its efficacy elsewhere, and in the next place some estimate should be given to the shareholders of what the probable expense would be.

Capt. SKELVIS observed that very little modern machinery had found its way into our western mines, excepting in the face of very great prejudice and opposition. This was especially the case with boring machines, but, as they were well aware, those machines had proved successful beyond the most sanguine expectations. Prejudice was being rapidly worn down, and he was sure that it would continue to be so, in spite of all opposition that could be offered.

With regard to their own mine, they must remember that the shaft was over 300 fms. in depth, that they had seven or eight ends going away one over the other, and that this would necessarily lead to a largely increased output of stuff which they would be unable to treat on their dressing floors, unless those floors were extended and the machinery introduced on the principle that had been suggested. There was no difficulty whatever in increasing the output, but if their dressing operations were continued on the present principle the profit would be altogether absorbed in labour cost. They could not work to separate so as to make it of value to their own mine, they must confess that before he saw the jiggling machines at work in Wales he was prejudiced against them, because he had heard a great deal about them for about two years, but he had never seen that they had done anything in the way of accomplishing the results that were claimed for them. But he was now convinced of their efficacy for cleansing and separation purposes. The mines were thrown off and dressed as clean as possible.

The CHAIRMAN explained that the dressing cost for the last two years had been very heavy, and the subject of continual complaint, but the agents had always told them that they were so situated that this cost could not be avoided. Assuming that they decided on having the jiggling machinery, he should like to know what the probable saving would be.—Capt. SKELVIS believed they would save one-half.

Capt. SKELVIS further pointed out that they must look forward to the necessity of providing additional winding power, because the present winding engine was not going to draw up all the stuff and do the crushing as well. Increased water power would also be required, and the matters had long been under consideration of the committee and the agents. The agents had seen all along that water could not possibly be provided without additional power to obtain it, and the question was whether it could be done by utilising the water from the river or by erecting one or two more water wheels on the side of the hill. They found that there were a multitude of difficulties in the way of this being done, and that even if they made a large outlay it was not likely to meet their ultimate requirements. They had, therefore, come to the conclusion that the best and wisest course was to bring up the engine to a more suitable position, and to place themselves in a position to meet the requirements of the mine not only for a day but for many years to come. He estimated the entire cost at not less than 1000*l.*—After some further discussion it was unanimously resolved to leave the matter in the hands of the committee and agents, and the meeting separated.

#### WHEEL JANE MINING COMPANY.

The general meeting of shareholders was held at the Guildhall Tavern, City, on Thursday.

Mr. JOHN HOCKING, jun. (the purser) in the chair.

The notice convening the meeting was read, and the statement of accounts for the four months ending March was submitted. The tin and lead sold realised 2240*l.*, leaving a net profit of 133*l.* 2s. 4d., and reducing the debit balance to 645*l.* 17s. 4d. There is a debt due to the bankers of 626*l.* 2s. 10d., represented by tin ore in stock of the value of 726*l.*

The CHAIRMAN was not aware that the statement of accounts upon the table required any remark from him, but he might congratulate them that even with the present low price of tin they had realised a profit of 133*l.* 2s. 4d., so that even a very moderate rise would place them in an excellent position. The accounts had been very carefully examined by Mr. Thorman Woodward, but he would give any explanations of them that shareholders might desire.

Mr. SMITH, in moving the reception and adoption of the balance-sheet, remarked that when they took into consideration the state of their affairs at this time last year they could not but regard the present statement as highly satisfactory. Had the price of tin only remained the same as last year the profit on the four months' operations would have been nearly 500*l.* instead of 133*l.* But it spoke exceedingly well for the management that, notwithstanding the exceptionally low price of tin, Wheel Jane had been pulled out of her bad state, and he felt that great credit was due both to the purser and to Capt. Southey for the benefits they had conferred upon the adventurers. He saw that the question was raised a short time since in the *Mining Journal* as to whether there was so much tin in stock as there was stated to be, and he must say that he did not himself feel entire confidence on the point. But he had since been to the mine, and he could assure them that the amount was there,

and he believed that now the mine was correctly stated to be in a fair way to prosperity.

The PURSER would remind them that their stock of tin originally stood at 8130*l.*, but the difference had been written off until it now stood at 7267*l.* They had also paid upon that tin 400*l.* back charges at; there could, therefore, be no question that had the tin been sold in the ordinary way every liability would have been paid off, and there would have been a good balance in hand.

Mr. CHAPMAN enquired whether everything had been charged up to date, as that appeared to him to be an important question after what they had recently heard with regard to Cornish mine management?—The PURSER said that everything was charged up to the date of the accounts—the end of the month of March—and vouchers were on the table.

Mr. GRANVILLE SHARP said that as to the stock of tin, he was at the mine at the beginning of the month, and the stock of tin was quite satisfied that none had been removed, as had been insinuated.

Capt. SOUTHEY then read the subjoined report:—

June 27.—Since our last general meeting of shareholders we have driven the deep adit level east of Gilbert's shaft 11 fms. 3 ft., and throughout the drive the lode I anticipate the most productive part is still standing to the north; this end is being driven by three men and three boys, at 8*l.* 10s. per fathom. In the adit we have driven a cross-cut about 13 fms. north, all the distance being through branches and lode; we have now reached what we consider to be the north end, and commenced to drive an end east on the course of the lode, which is worth the part carried about 12*l.* per fathom; this end is being driven by two men and two boys, at 10*l.* per fathom; we are also driving an end west at the same level, and on the same lode by three men and three boys, at 10*l.* per fathom; lode worth 8*l.* per fathom. Within the past four months we have increased our output in order to lay open more tribute ground, and our underground operations are now composed of 13 tribute pitches and three tribute workings. In the past month we have communicated a winze with Truan's pitch, so that the tin ore will increase in this direction during the ensuing quarter. The price realised for our tin is 3*l.* 17s. 6d. per ton less than the previous four months' average, but I am pleased to say that (after allowing 100*l.* interest for bankers' charges on the tin stock) we have more than paid costs on the four months' working, and I do not hesitate to say that if the price this tin was stocked at were now ruling this mine would pay good dividends.—R. SOUTHEY.

Capt. SOUTHEY, in reply to enquiries as to the character and value of the lode at present stated that it was about the same as it had been for the last 12 months, and was worth from 20*l.* to 30*l.* of tin to the ton. He never saw a larger lode.

Capt. NANCARROW confirmed Capt. Southey's opinion, and remarked that they only wanted a higher price for tin to make the mine highly prosperous.

Capt. SOUTHEY said that at 50*l.* per ton, which certainly was not a high price, they could pay dividends.

The report and accounts were then unanimously received and passed; the salary of the purser was increased from 3*l.* 3s. to 5*l.* 5s. per month. Mr. SMITH, in moving the resolution, remarking that he believed that but for the exertions of Mr. Hocking the mine would have been in the Stannary Court instead of making profit; and Mr. Granville Sharp was appointed to provide a London office of reference at 4*l.* 4s. per month.

The CHAIRMAN said it had been usual at each general meeting to pass a resolution authorising the carrying forward of the amount due to the bankers.

Several shareholders suggested that this was altogether unnecessary, as the amount being shown in the accounts no question could arise as to the shareholders being liable.

The CHAIRMAN would prefer the resolution being passed, not because there was a probability of the shareholders questioning their liability, but because it always had been done, and prevented the possibility of anyone at any future time saying that they were ignorant of its existence; it would also, he would think, be a satisfaction to the bankers.

The resolution that the carrying forward of the amount due to the bankers—626*l.* 2s. 10d.—be confirmed, was then unanimously passed.

The CHAIRMAN stated that Mr. Bennett's, their previous auditor, had retired through old age from the office of auditor, and himself and Captain Southey had temporarily appointed Mr. Thorman Woodward auditor, but if that gentleman was to continue in office he would have to be formally appointed by the meeting.

Mr. Woodward was unanimously appointed at 6*l.* 6s. per annum remuneration. (2*l.* 2s. per account.)

The meeting was then made special, and 73 shares in arrears of all were declared absolutely forfeited, the CHAIRMAN stating that according to the rule in the Statutes the owners could claim their restoration upon paying the amount due before the confirmation of the resolution. The confirmatory meeting is to be held within one month.

Thanks were unanimously voted to Capt. Southey and the purser, and the proceedings terminated.

#### WEST TOLGUS MINING COMPANY.

A two-monthly meeting of adventurers was held on Monday at the mine, Mr. RICHARD TAYLOR presiding. That gentleman read the statement of accounts, from which it appeared that the labour costs for the eight weeks ending April 27 amounted to 1644*l.*; merchants' bills, 1240*l.*; charged on account of the extra month, 150*l.*; making a total of about 3035*l.* The receipts were—For 592 tons of copper ore, 3653*l.*, and 16*l.* for gravel; but from this 91*l.* had to be deducted for dues; leaving a profit on the two months' working of 544*l.* From the last account a balance of 300*l.* was brought forward, leaving a sum of 844*l.* now available for dividend. Out of this dividend of 1*l.* per share was declared, and a balance of 332*l.* carried forward to the credit of next account. The agents' report said:—

Taylor's engine-shaft is being sunk below the 135 in killas, by 12 men, at 30*l.* per fathom; the shaft is down 11 fms. below the 135. We intend sinking one more for a fork before beginning to drive the 145. The lode in the 135 is about 18 in. wide, looking kindly, but not yielding any ore; driving by four men, at 4*l.* 10s. per fathom. The lode in the 135 west is 8 ft. wide, yielding 4 tons of ore per fathom; driving by six men, at 6*l.* 10s. per fathom. The end is now 54 fms. west of No. 4 winze, and 48 fms. west of Taylor's shaft. The stopes in back of the 135, west of shaft, east of No. 1 winze, will yield 3 tons of ore, worth 18*l.* per fathom; driving by six men, at 4*l.* 6s. per fathom. The stopes in the 135, east of No. 1 winze, will yield 5 tons of ore, worth 6*l.* per fathom, and stopping by six men, at 2*l.* 15s. per fathom. The stopes in the back of this level, east of No. 3 winze, will yield 20 tons of ore, worth 10*l.* per fathom, and stopping by nine men, at 5*l.* per fathom. The lode averages 10 ft. wide in Nos. 2 and 3 stopes. There is one stoping the side of the 135, east of No. 4 winze, by four men, at 2*l.* 5s. per cubic fathom, yielding 6 tons of ore, worth 40*l.* per fathom. The lode in the 125, west of shaft, is 1 ft. wide, with a little saving work; driving by six men, at 6*l.* 10s. per fathom; we are expecting an improvement in this end soon, there is a goodly lode gone down in the level over a little before this end. The lode in the 95 is 4 ft. wide, yielding a little ore, driving by four men, at 7*l.* per fathom.—Richard's Shaft: The lode in the 95 east is 5 ft. wide, with a little ore, but hardly enough to value; driving by eight men, at 7*l.* per fathom. There are about 4 fms. more to drive to communicate with the level west of Taylor's shaft. The 95 west is being driven in killas at 4*l.* per fathom; this end is 15 ft. west from shaft. We shall cut into the lode before the end of the month. The lode in the rise in back of the 85, west of shaft, is 4 ft. wide, yielding 2½ tons of ore per fathom; rising by six men, at 7*l.* per fathom. The lode in the 75 is about 1 ft. wide, yielding 1 ton of ore per fathom; driving by four men, at 8*l.* per fathom. The lode in the 65 west is 2 ft. wide, but poor; driving by four men, at 8*l.* 10s. per fathom. The cross-cut for the next two months realised, after deducting the lord's dues, 4047*l.* The costs will probably be from 100*l.* to 200*l.* more than those charged in the accounts submitted to this meeting.

The report and accounts having been passed, the CHAIRMAN reported that, in accordance with the arrangement made at the last meeting, he had had an interview with Lord Roberts, who expressed the same kindly feelings towards the adventurers that he had ever done, and promised that on his return into Cornwall, out of which he had hitherto been detained by illness, he would give the question of the renewal of the lease, and the conditions under which that renewal should be granted, his best consideration. (Hear, hear.) He thought the adventurers would agree with him that the report of the agents was a very satisfactory one. They had lately been looking forward to the probable emergencies of the coming winter, because experience had proved to them that winter was always a troublesome time, and hence they had been anxious at an early period to render themselves as secure as possible against accident. Capt. Hancock had been pushing on the work with all speed in the 95 fm. level, in order to obtain communication from shaft to shaft, and he was already under the 60 so as to take back the water through the 95 and Richard's shaft, where they had spare power, and if they could only succeed in this they would effectively secure themselves for the winter. They hoped to complete this work in about a month from the present time. Some in piping would be required, and he recommended that it should be purchased in the North of England, where they could obtain it of good quality, and at a cheap rate. He considered that the mine had excellent prospects before it, for they had rich deposits of ore, especially in the 135 fm. level, and to all appearances they were more permanent than ever. (Applause.)

Mr. HAYE, the purser, in answer to a question from Mr. TYACKE, stated that the mine paid no bankers' charges. There was an arrangement between the bankers and themselves that a certain amount of cash should be kept at the bank, and in this way the payment of bank charges was avoided. (Hear, hear.)

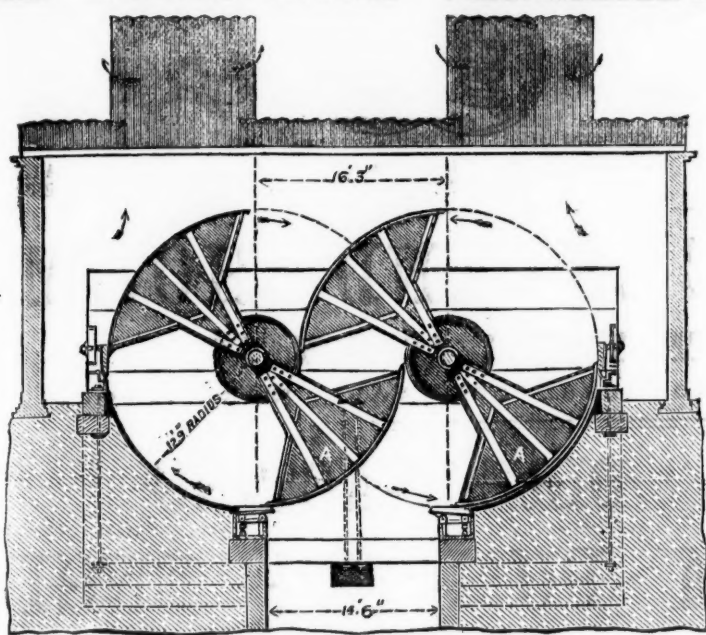
The CHAIRMAN added that the Stannaries Act required of them that a balance-sheet should be laid before the shareholders at each meeting, so that they might at all times know the exact position in which they stood. This had always been done at West Tolgus, and he believed that if it had been done, upon in other mines there would have been much greater confidence felt in Cornish mines than was now the case. (Hear, hear.)—*Western Daily Mercury.*

VAN RAILWAY COMPANY.—At a special general meeting of shareholders held on Monday at the offices of the company, Austinfrans, Mr. A. R. Broughton Knight, the vice-chairman, presiding, a resolution was passed authorising the directors to borrow 6000*l.* on mortgage or debenture stock, on such terms and at such times as they may think fit. The capital account has a debit of 1300*l.*, which has been taken from revenue, and it is to repay this and to provide another engine that the money is required.

The Panullic Copper Company debenture holders are informed that the coupons due on Dec. 15 next may now be presented at the Consolidated Bank for payment under discount at Bank minimum rate on day of presentation.



## THE ROOTS MINE VENTILATOR.



CROSS SECTION OF VENTILATOR

## THE ROOTS MINE VENTILATOR.

The satisfactory manner in which the Roots mine ventilator is working at Chilton Colliery, Ferry Hill, where it has been adopted by Mr. John Lancaster, of Rugby, and the novelty of the application of the invention to this purpose, has led to a considerable amount of attention being directed to it, and at the recent meeting of the Institution of Mechanical Engineers, Mr. E. Hamer Carbutt (Messrs. Thwaites and Carbutt, Bradford) read a paper giving an interesting description of the apparatus. He states that the Roots blower is a rotary air compressing machine, as distinguished from a fan, which throws the air off by centrifugal action. In principle it is analogous to a blowing cylinder, with the difference that the air is expelled constantly in one direction, and in four distinct volumes at each revolution of the blower; but with a blowing cylinder the direction of the current of air is altered at each end of the stroke. Long before its introduction into this country it had been extensively used in America; blowers of a capacity of 100,000 cubic feet per minute had been constructed there, and one of this capacity was employed for working a pneumatic railway under the Broadway, New York. For smelting and similar purposes the blower had earned a reputation, and was well known amongst engineers and ironfounders in that country. In 1867 it was shown at the Paris Exhibition, and attracted considerable attention and critical examination at the hands of practical men. The writer was strongly advised to introduce it into this country by the late Mr. Zerah Colburn, who was familiar with its working in America, and emphatically declared that it was superior to any fan-blowing machine in operation, and in his opinion it would occupy the first place amongst machines of its class.

The leading feature of the Roots blower is the use of two duplicate rotary pistons, fixed upon separate shafts, and working in a casing, which is provided with inlet and outlet openings either at the top and bottom, or at the sides, according to the position in which the machine is arranged. The rotary pistons in revolving are maintained in their proper relative positions by gearing on the shafts, and they revolve closely together, but not in actual contact with each other, or with the casing. The ventilator fixed at the Chilton Colliery was started at the beginning of this year, it having been in constant work up to the present time. It consists of two rotary pistons, A, A, which are each 25 ft. diameter, and 13 ft. wide, and are built all upon steel shafts. Upon each of the shafts are keyed five cast-iron disc plates, having flanges at their circumference which are all turned to exactly the same diameter. In each disc plate there are three wrought-iron bars fixed on each side of the centre, and reaching to the outside of the rotary piston; planed recesses are provided in the disc plates to receive the bars, which are also secured to the disc plates by bolts turned to fit. The outer ends of the bars are widened, and marked off and slotted to the radius of the outer circle. Angle irons bent to the radius of the outer circle are rivetted to the extremities of the bars, and are covered with  $\frac{1}{2}$ -in. sheet-iron plates; the centre circles are also covered with  $\frac{1}{2}$ -in. sheet-iron plates on the turned flanges of the disc plates. The sides of the pistons are covered with wood, and the ends with sheet-iron. These rotary pistons revolve in bearings fixed upon deep cast-iron girders, which form the framework of the ventilator pit, and are connected together at each end of the ventilator by cross girders. The girders and the cast-iron side plates above them are planed on their inside surfaces, and the stonework of the ventilator pit is dressed off level with the planed girders. The engines to drive the ventilator are a pair of 28-in. cylinders, with 4-ft. stroke, and provided with adjustable cut-off valves. They are placed at right angles to the ventilator, and are connected to it with bevel wheels 9 ft. 2 in. diameter, two bevel wheels being fixed upon the crank shaft, each gearing into a bevel wheel keyed upon the end of the ventilator shafts. The engine beds are carried along and fixed upon a stay girder, securely keyed and bolted to the main girder. The main girders are fixed 13 ft.  $\frac{1}{2}$  in. apart, therefore, the clearance between the rotary pistons of 13 ft., and the sides of the ventilator pit is only  $\frac{1}{2}$  in. on each side. At each end of the ventilator pit, and at the bottom on each side of the inlet from the up-cast shaft, adjustable packing blocks of timber are fixed upon hinged iron frames, and can be adjusted with screws and nuts; these blocks are set up quite close to the periphery of the rotary pistons within  $\frac{1}{2}$  in. The clearance between the periphery of one of the rotary pistons and the centre circle of the other is also the same, and thus in any part of the ventilator the clearance for loss by returning of the air is not more than  $\frac{1}{2}$  in.; this will account for the close correspondence of the measured quantities of air with the calculated capacity or displacement, which is 5800 cubic feet per revolution. Between the packing blocks the ventilator pit is dug out and lined with cement; but there is considerable space between the layer of cement and the outside circle of the rotary pistons, the dependance is placed only upon the packing blocks to maintain the tightness of the pistons with the ends of the ventilator pit.

The rotary pistons are equally balanced, and also the parts of the engine; and the friction diagram, taken during one experiment, shows that 3.10 indicated horse-power maintained the ventilator engine running at a constant speed of three revolutions per minute; this shows that the balancing has had attention, and that not much power is lost in the friction of the moving parts. Chilton Colliery is a new pit raising 800 tons of coal per day, and the present requirements in the way of ventilation are amply met by running the ventilator at 15 revolutions per minute, giving a calculated displacement of 87,000 cubic feet of air per minute. At this speed better results would be obtained by using only one cylinder, and letting the other engine stand, as will be done in the case of repairs; the two engines are only intended to be used when the ventilator is working up to its full maximum quantity of 200,000 cubic feet of air per minute. The arrangement of the engine-house and ventilator building is shown; the discharged air escapes through perforated openings in the roof, and owing to the very large area of outlet from the ventilator—the top of the ventilator casing being left entirely

open—the air that is being exhausted from the pit must necessarily be delivered into the atmosphere at a lower velocity than is usual with other ventilating machines.

A carefully arranged comparative table prepared by Mr. Carbutt, shows that whilst the useful effect secured with the Roots blower, running at 12 to 21 revolutions, was  $51\frac{1}{2}$  to 77 per cent., averaging 62 $\frac{1}{2}$  per cent.; that of Cooke's ventilator, the best hitherto in the market, running at 26 to 29 revolutions, was 58 $\frac{1}{2}$  to 64 per cent., averaging 60 $\frac{1}{2}$  per cent. The figures for a Waddle, a Rammell, a Leeds fan, and five Guibals are given, but only one Guibal exceeds 50 per cent. Mr. Carbutt points out that the comparison shows that the range of the Roots blower when employed as an exhaustor, is in advance of any of the previous mechanical ventilators; and in the writer's opinion this would be a decided advantage in the case of an explosion. When the air doors become disarranged, the ventilation of the mine is interfered with at the moment when it would be of the greatest service, and this owing to the limited power of fan ventilators, which can only be depended upon to about 3 in. water-gauge; but in a case of emergency, with a Roots ventilator, similar to the one described, the machine could be instantly driven at its maximum power, and would speedily clear the workings of the choke-damp, fire-damp, or after-damp. Since explosions cannot always be prevented, it is of importance that the deadly gases should be drawn out in the shortest possible space of time, and replaced with pure air; and from present experience this ventilator appears to be well fitted to suit these requirements.

Cog-wheels are employed in all these modified blowers, the wheels playing the important part of maintaining the rotary pistons in their proper relative positions in revolving; and so long as the pistons can be thus maintained there will be an absence of internal friction, and the friction of the machine is confined to the shaft bearings and the cog-wheels. Hence the importance of providing large wearing surfaces that can be easily renewed, and of having accurately pitched wheels; great attention has been bestowed upon these parts, and the blowers as now made are noiseless compared with those made at an earlier date. In fitting up blowers either for forcing or for exhausting, care has to be taken that the air-conducting pipes and shut-off valves are perfectly tight; and an escape valve should be fixed upon the air pipes to relieve the blower from too great an increase of pressure of air caused by the closing of the shut-off valves while the machine is in operation. The maximum speed of these blowers, with wood-covered rotary pistons, is from 300 to 400 revolutions per minute, and with iron rotary pistons from 100 to 250 revolutions per minute; and it will be noted that these speeds are moderate when compared with the speeds of fans to produce the same pressures of air. This blower has also been applied to move a large volume of air at slow velocity by thus taking advantage of the injector principle. The blower forces a jet of air at quick velocity into a large annular funnel-shaped opening; the consequence is that the current of air from the blower draws along with it at a slow velocity from four to eight times the volume of air that is delivered by the jet from the blower; and this arrangement has been successfully carried out in drying machines and for ventilation.

It is mentioned that the new ventilator has been recommended by Mr. C. Markham, of the Staveley Coal and Iron Company, and that the engine and gearing for the ventilator at Chilton have been arranged under the direction of Mr. James Barrows, of Wigan, consulting engineer to the South Durham Coal Company, who also possesses other extensive collieries in Durham, and have other systems of ventilation in operation.

**COATING STEAM-BOILERS.**—The object of the invention of Mr. R. McIVOR, of Liverpool, is to provide a non-conducting radiation preventing material for coating steam-boilers, pipes, and the like, which shall be durable, efficient, and easily applied, and consists in employing ground or granulated cork or cork shavings agglutinated or held together by glue, shellac, or the like, preferably mixed with a metallic oxide, such as zinc oxide. The addition of the metallic oxides serves to harden and consolidate the glue or like substance, and prevents the injurious effects of heat, cold, and moisture thereon. He finds that 12 parts by weight of ground or granulated cork or cork shavings, 16 parts by weight of glue, gum, shellac, or like agglutinating substance, and one part by weight of oxide of zinc when mixed with water and worked together, so as to form a homogeneous adhesive mass, formed when rolled or spread out into sheets, so as to cover the boiler or other object, an excellent material for preventing the radiation of heat. The above proportions of material are found to answer well, but various other proportions may be used if desired. The material above described is rolled or formed into sheets of from  $1\frac{1}{2}$  in. to 2 in. in thickness whilst in a plastic condition by any ordinary or well-known means, and is, if desired, backed or coated on one side with canvas or flexible material. In practice the material is cut to the desired size and wrapped round the object to be covered; the ends which meet are bevelled or chamfered off so as to overlap each other, and they are glued or otherwise connected together.

**STOPPING LEAKS, AND PREVENTING CORROSION OF BOILERS.**—In protecting the interior surface of the bottom of high-pressure boilers by Portland and Roman cement as is at present largely done, it is found after a short time the cement cracks and peels off the iron, leaving the surface as liable to leakage and corrosion as heretofore. To avoid this evil Mr. HUGH FERGUSON, of Liverpool, proposes to mix with the cement coal tar, pitch, asphalt, or other viscid material, and bran, ground chaff, or other pulverulent absorbent material. The result is a hard elastic mass which seeks out all cracks and apertures, leaks, &c., and fills them up, which sticks tight to the boiler shell and prevents the access of water. Should a leak occur the semi-fluid or viscid nature of the tar and pulverulent nature of the bran causes these two to run into the leak and fill it up. In mixing he takes about 10 gallons of tar and 3 cwt. of Port-

land cement, and adds bran or other similar pulverulent matter till the whole mixes into a good stiff paste, into which a man can just press his finger. If it is not hard enough add more cement; if it is inclined to be crumbly add more tar. He also, for use in steamships adds cast-iron borings. Exact proportions cannot be given as they vary so very much with the quality of the materials used, and very large latitude can be given without practical injury.

## JIGGING MACHINERY.

The monthly meeting of members of the Mining Institute of Cornwall was held at the Assembly Rooms, Camborne, on Tuesday. Capt. Wm. Teague, jun., the vice-president, occupied the chair, and after a few brief remarks and letters read excusing attendance, Mr. R. A. VARDEN read a paper on "Jigging Machinery and its application to the Dressing of Cornish Ores." In the course of his remarks he said:—"As the last three papers brought before this Institute have had especial reference to dressing appliances, I think the present subject may in some measure be looked upon as a sequel to them, and be none the less applicable from the fact that it is generally pronounced to be in the dressing department that Cornish mines are weakest. It is an undisputed fact that as regards underground work they cannot be equalled. It is, therefore, all the more surprising that, comparatively speaking, so few improvements have been made on the floors, especially as there seems plenty of room for inventive genius to display itself to advantage. Although jigging has until now not been extensively used in Cornwall, it has certainly been approved of wherever it has been tried, and consequently deserves more attention. To ensure successful jigging there must be—first, a thorough classification of the stuff before delivering it on to the machine. Second, an adequate length and number of plunger strokes. Third, a suitable motion of the plunger. Fourth, a proper depth and size of bedding. Fifth, clean water. Under the heading of a thorough classification of the stuff being necessary before jigging, I may say that it is useless to try and obtain a complete separation at once without doing so. The grounds for this assertion are based upon theoretical reasons substantiated by practical experience. With regard to the number of plunger strokes, it is impossible to lay down any definite rule, experience proving the best guide on such points. The same will apply to the length of stroke. It has, however, been found that about 120 or 130 strokes per minute of from 1 in. to  $\frac{3}{4}$  in. are the prevailing figures, and also that the finer the stuff the greater number and less length of stroke is requisite. The object to be aimed at is to prevent the stuff from settling down on the sieve and forming a compact mass, as in this case a complete separation cannot be expected. The bedding that should be left on the sieve has, perhaps, the greatest influence on the working of the jigger, but important as this point is, it is quite impossible to lay down any rule for its regulation, only that the richer the stuff the less bedding will be required. The size of the material composing it should be about three times the size of the sieve meshes. A mixture of different sizes has been found desirable. It is maintained that if the stuff be all of one size it will either be too porous or too compact. Clean water is desirable for all jigging purposes, but where fine stuff has to be dealt with it becomes a necessity, because water containing sludge will tend to bind the particles together and prevent their free movement. It is also necessary to provide a sufficient quantity, for if there be too little the stuff will cake on the sieve and be affected but little by the process. There are several other conditions that should be fulfilled, besides those above enumerated, in order to make jigging a success, such as the manner of feeding the machine, position of the machine on the floors, and many other minor points of a similar character.

The machines now before the public are so numerous that it would be a very difficult task to enumerate them, but the first machine that seems to demand our notice is the old brake sieve or hand jigger, so extensively used on most copper floors in Cornwall. In the face of the vast improvements that have of late years been made in jigging machinery, it seems very improbable that this machine will be able to hold its own much longer, as the continuous working jiggers, such as the West Chiverton, Collom's and Green's, as a rule, not only dress the stuff cleaner and quicker, but save a great deal of the ore that would be otherwise thrown away. On the copper floors of this district it is generally calculated that one of these machines will turn over about 2 tons of ore per day of 10 hours. The West Chiverton jigger was, I believe, first erected in its present form by the manager of the mine, and possesses the estimable qualities of simplicity and cheapness, besides doing its work in a most efficient manner. This is a side plunger jigger in contradistinction to those with the plunger underneath the sieve, which latter sort cannot be recommended on account of all the stuff that passes through the sieve having also to pass through the plunger, which complicates the machine to an undesirable extent. The arrangement of the machines at West Chiverton, where there are a great many at work, is quite worthy of special attention. During the whole of the process, from the time that the stuff is put in the crusher until leaving the jigger, it is not touched by hand. I believe that stuff containing but 2 per cent. of lead or blende can be worked at a profit. The cost of this jigger is about 35*l*. The machine works with 140 strokes per minute, with a length of 1 in. to  $1\frac{1}{2}$  in. Collom's patent jigger has been in use in Cornwall for several years, both for copper ores and tin, at the Re-trouquet Stream Works, and it may now be seen at work at West Tolgus. At Mellanear also there is one in course of erection. It differs materially from those already described in the manner of giving the motion to the plunger, the mechanism in this case being rather more complicated. The results obtained with this machine are in every way highly satisfactory; they can turn over 22 tons of ore in 10 hours at a very small cost. The spiral springs for making the return stroke of the plunger is the weakest part of the machine, they having to be renewed about four times a month. The jigger works with from 100 to 120 strokes per minute, of from  $\frac{1}{2}$  in. to 1 in. The cost of this machine as sent from Stonecroft Foundry is 100*l*. In conclusion, let me add a few words concerning the advantages of jigging, which may be briefly summed up as cheaper, more expeditious, producing better quality stuff than is usually obtained with other methods, and lastly, but not of the least importance, a smaller amount of waste. Jigging for lead is so universally acknowledged to be the most advantageous manner of treating those ores, that it will not be necessary for me to go into the subject more deeply, but as a proof of its excellence I will mention West Chiverton, where the mixture of lead and blende is separated with the greatest ease by the machinery there in use, the cost per month of working 1600 tons of stuff, including crushing, sizing, jigging, and washing, amounting to about 50*l*.

An interesting discussion followed the paper, and Mr. Varden was heartily thanked at the close for his valuable contribution.

—Western Daily Mercury.

**PRODUCTION OF BLOOMS OR INGOTS OF IRON.**—For uniting puddled bars of iron in order to form blooms or ingots, Messrs. SACRE, PERKINS, and SMELLE, of Gorton, near Manchester, propose to employ a mould of any suitable form, made by preference in two or more parts which are capable of being separated. Into this mould they place a ball of iron puddled in the usual manner, and upon it they place another, or two or more of such puddled balls, after which they cause a ram to enter the mould and press or hammer the whole into one mass, which operation may be effected by steam, hydraulic, or other pressure. This having been done, if required another ball or number of balls may be added with the like pressure until a bloom or ingot of the required weight has been produced, after which the mould may be separated for facilitating the discharge of the said bloom or ingot. If desired, perforations may be formed in the sides of the mould for the escape of cinder.

**HOLLOWAY'S PILLS.**—Invalids distracted by indigestion and discouraged in their search for its remedy should make trial of this never-failing medicine. A lady, long a martyr to dyspeptic tortures, writes that Holloway's pills made her feel as if a burden had been taken off her. Her spirits formerly low, have greatly improved; her capricious appetite has given place to healthy hunger; her dull, sick headache has departed, and gradually so marvellous a change has been effected, that she is altogether a new creature, and again fit for her duties. These pills may be administered with safety to the most delicate. They never act harshly, nor do they ever induce weakness; they rightly direct deranged, and control excessive, action.



PARIS INTERNATIONAL  
EXHIBITION, 1867.VIENNA INTERNATIONAL  
EXHIBITION, 1873.LONDON INTERNATIONAL  
EXHIBITION, 1874.CORNWALL POLYTECHNIC  
SOCIETY, 1867 and 1873.

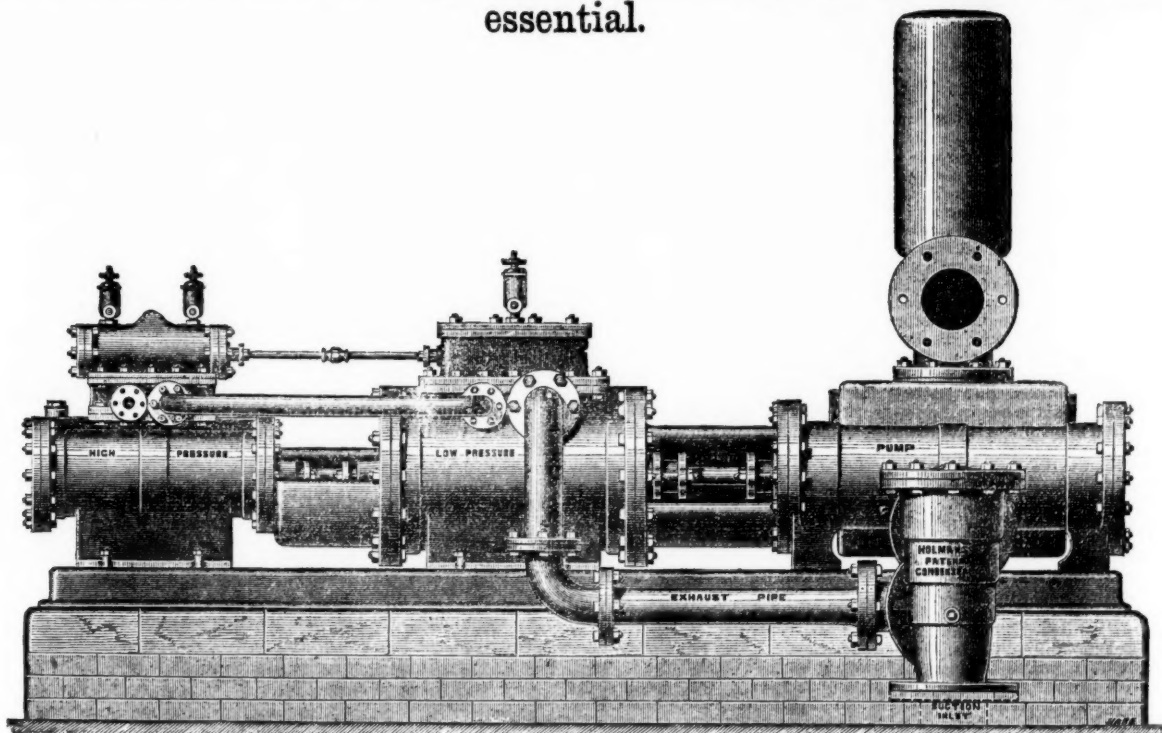
# TANGYE BROTHERS AND HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.,

AND BIRMINGHAM, (TANGYE BROTHERS), CORNWALL WORKS, SOHO.

## THE "SPECIAL" DIRECT-ACTING COMPOUND STEAM PUMPING ENGINE,

For use in Mines, Water Works, Sewage Works, and all purposes where Economy of Fuel is essential.



After several years of successful application for all purposes to which steam-driven pumps can be applied, THE "SPECIAL" STEAM PUMP STILL MAINTAINS THE FIRST POSITION IN THE MARKET, notwithstanding that it alone—of all direct-acting pumps—has been subjected to the great variety of severe tests that must be encountered in such a period of time. Some valuable improvements have been suggested in the course of a long experience, and their adoption has rendered the apparatus at once

### THE SIMPLEST AND MOST CERTAIN IN ACTION.

The illustration shows an extension of the principle of this Pump to a Compound Steam Pumping Engine, by which the economical advantages resulting from the expansion and condensation of steam are very simply and effectively obtained. The steam after leaving the high-pressure cylinder is received into and expanded in the low-pressure cylinder, and is thus used twice over before being exhausted into the condenser or atmosphere. The Engine combines simplicity, certainty of action, great compactness, fewness of parts, and consequent reduction in wear and tear.

Several thousands of the "Special" Steam Pumping Engines, with high-pressure cylinders only, are in use in British and Foreign Mines, Water Works, &c.,—and for confined situations, or where Engines of a comparatively small size only are necessary, they will still meet all requirements—but their application will be very largely increased, since it has been found practicable to embrace the important features of expanding and condensing the steam, so that increased power may be obtained, and the consumption of fuel greatly economised.

THE "SPECIAL" DIRECT-ACTING COMPOUND STEAM PUMPING ENGINE is the most simple appliance for deep mine draining and general purposes of pumping ever practically developed, and the first cost is very moderate compared with the method of raising water from great depths by a series of 40 to 50 fathom lifts. No costly engine-houses or massive foundations, no repetition of plunger lifts, ponderous connecting rods, or complication of pit-work are required, while they allow a clear shaft for hauling purposes.

### SIZES AND PARTICULARS.

Diameter of High-pressure Cylinder.....In.	8	8	8	10	10	10	10	12	12	12	12	14	14	14	14
Ditto of Low-pressure Cylinder.....In.	14	14	14	18	18	18	18	21	21	21	21	24	24	24	24
Ditto of Water Cylinder.....In.	4	5	6	5	6	7	8	6	7	8	10	7	8	10	12
Length of stroke.....In.	24	24	24	24	24	24	24	24	24	24	24	36	36	36	36
Gallons per hour approximate.....	3300	6100	8800	6100	8800	12,000	15,650	8,800	12,000	15,650	24,450	12,000	15,650	24,450	35,225
Diameter Suction and Delivery.....In.	3	3½	4	3½	4	5	6	4	5	6	8	5	6	8	9
Diameter High-pressure Steam Inlet.....In.	1½	1½	1½	1½	1½	1½	1½	2½	2½	2½	2½	2½	2½	2½	2½
Diameter Low-pressure Steam Exhaust.....In.	1½	1½	1½	1½	1½	1½	1½	2½	2½	2½	2½	2½	2½	2½	2½
Height in feet water can be raised with 40 lbs. pressure per square inch in } Non-condensing...	360	330	160	360	250	184	140	360	264	202	130	360	275	175	122
Ditto ditto ditto—with Holman's Condenser...	480	307	213	480	333	245	187	480	352	269	173	480	367	234	162
Ditto ditto ditto—with Air-pump Condenser...	600	384	267	600	417	306	335	600	440	337	216	600	459	203	203

### CONTINUED.

Diameter of High-pressure Cylinder.....In.	16	16	16	16	18	18	18	18	21	21	21	24	24	24	30
Ditto of Low-pressure Cylinder.....In.	28	28	28	28	32	32	32	32	36	36	36	42	42	42	52
Ditto of Water Cylinder.....In.	8	10	12	14	8	10	12	14	10	12	14	10	12	14	14
Length of stroke.....In.	36	36	36	36	48	48	48	48	48	48	48	48	48	48	48
Gallons per hour approximate.....	15,650	24,450	35,225	47,950	13,650	24,450	35,225	47,950	24,450	35,225	47,950	24,450	35,225	47,950	47,950
Diameter Suction and Delivery.....In.	6	8	9	10	6	8	9	10	8	9	10	8	9	10	10
Diameter High-pressure Steam Inlet.....In.	2½	2½	2½	2½	3	3	3	3	3½	3½	3½	4	4	4	5½
Diameter Low-pressure Steam Exhaust.....In.	3	2	3	3	3½	3½	3½	3½	4	4	4	5	5	5	6½
Height in feet water can be raised with 40 lbs. pressure per square inch in } Non-condensing...	360	230	160	118	456	292	202	149	397	276	202	518	360	264	413
Ditto ditto ditto—with Holman's Condenser...	480	307	213	154	603	389	269	198	528	363	269	691	480	352	550
Ditto ditto ditto—with Air-pump Condenser...	600	384	267	191	750	486	337	248	660	450	337	864	600	440	689

### PRICES GIVEN ON RECEIPT OF REQUIREMENTS.

Any number of these Engines can be placed side by side, to work in conjunction or separately as desired, thereby multiplying the work of one Pump to any extent.

NORTH OF ENGLAND HOUSE  
SOUTH WALES HOUSE...

TANGYE BROTHERS AND RAKE, ST. NICHOLAS BUILDINGS, NEWCASTLE-ON-TYNE.  
TANGYE BROTHERS AND STEEL, Tradeagar Place, NEWPORT, Mon.; and Oxford Building, SWANSEA.



# STEAM BOILERS

OF ALL KINDS MADE TO ORDER AT THE SHORTEST NOTICE BY THE

TURNBRIDGE IRON & BOILER WORKS COMPANY, LIMITED, HUDDERSFIELD.

London Agent—Mr. W. PARSEY, 46, FISH STREET HILL, E.C.

## COLEBROOK'S PATENT STEAM PUMPS, FOR HIGH OR LOW LIFTS AND GENERAL PURPOSES.

SOLE MAKERS,—

# MAY AND MOUNTAIN,

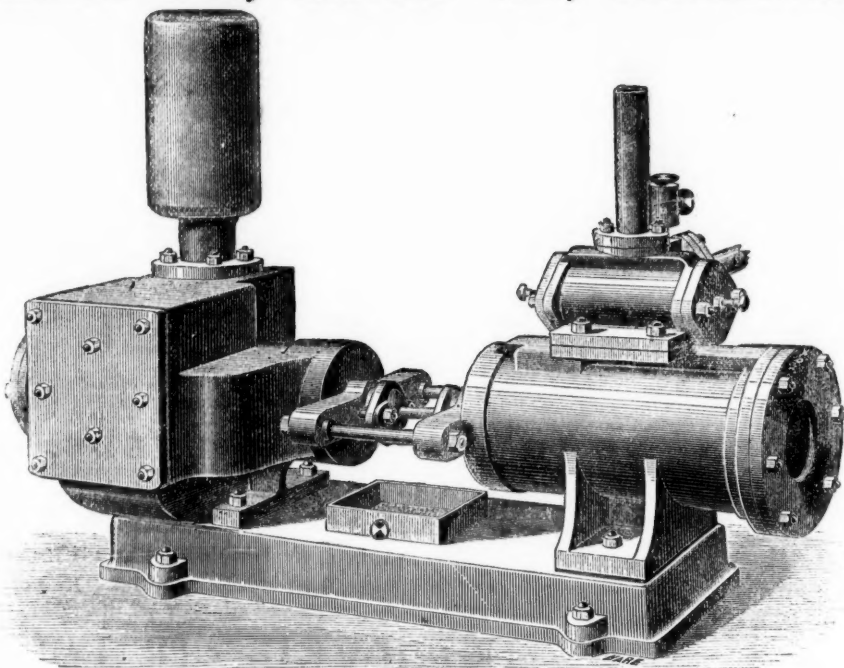
BERKLEY ST., BROAD ST., BIRMINGHAM.

The accompanying Engraving represents a Steam Pump, suitable for general purposes; it possesses the following advantages over any other Steam Pump yet before the public:—

1st.—No tappets, eccentrics, levers, or other mechanical appliances are used to actuate the steam slide valve, but this office is performed by the exhaust steam.

2nd.—The only working parts in the steam cylinder are the piston and slide valve, and as there are no working parts in either the piston or cylinder covers, the full length of stroke is obtained.

3rd.—The slide valve is so easy of access that it can be examined, cleaned, and replaced in a few minutes, and it is impossible to make any error in replacing it



after examination, because it is immaterial which way it is inserted in the valve-box, whether one way or the other upwards, or whether end for end.

The Pump Valves are Colebrook's Patent, and are made in one piece. They are either of canvas, leather, india rubber, or other material, to suit the nature of the liquid to be pumped, and can be replaced in a very short time by any ordinary workman.

These Pumps are suitable for hot or cold water, hot or cold wort, sewage, ammoniacal liquor, tar, &c., and are adapted for use in breweries, chemical works, collieries, paper mills, dye-works, brick-yards, and for almost any other purpose.

### SIZES AND PRICES OF COLEBROOK'S PATENT STEAM PUMPS.

Diameter of Steam Cylinder.....Inches	1½	3	3	3	3	4	4	4	4	5	5	5	6	6	6	6	7	7	7	7	7	8
Diameter of Pump Cylinder.....Inches	1	1½	2	2½	3	2	2½	3	4	3	4	5	3	4	5	6	3	4	5	6	7	4
Length of Stroke.....Inches	6	12	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Price .....	£12	£16	£17	£18	£19	£19	£20	£22	£25	£23	£28	£32	£26	£33	£36	£41	£30	£38	£41	£45	£52	£40

Diameter of Steam Cylinder.....Inches	8	8	8	8	9	9	9	9	9	10	10	10	10	10	10	12	12	12	12	12	12	...
Diameter of Pump Cylinder.....Inches	5	6	7	8	5	6	7	8	9	5	6	7	8	9	10	6	7	8	9	10	12	...
Length of Stroke.....Inches	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	...
Price .....	£45	£50	£56	£65	£50	£55	£60	£70	£81	£62	£68	£70	£80	£95	£100	£80	£85	£90	£100	£115	£135	...

## THE "CHAMPION" ROCK BORER

STANDS UNRIVALLED

For Tunnels, Mines, Quarries, Harbour Works, Cutting Blocks of Granite, &c.

The working parts are made of the toughest steel and phosphor-bronze—steel castings are also used—so as to combine strength with light weight.

### AIR-COMPRESSING MACHINERY

Of the simplest and best construction.

Combined Water-pressure Engines and Air-compressors,

Giving most excellent results.

Mechanical and Consulting Engineers,

ULLATHORNE AND CO., 63, QUEEN VICTORIA STREET, LONDON, E.C

### RAILS FOR SALE.

Bridge Section, 10 to 25 lbs. per yard.  
Flange Section, 16 to 70 lbs. per yard.  
DH Section, 50, 60, to 70 lbs. per yard.  
Steel Rails, 30, 36, 54, 58, to 66 lbs. per yard.

NEW PERFECT, NEW DEFECTIVE, AND SECONDHAND IN STOCK.

PERMANENT WAY RAILS, of all sections, made to order.

For sections and price, apply to—

ROBERT WRIGHTSON,  
NEWPORT, MON.

TO COLLIERY AND MINE OWNERS, ENGINEERS, IRONFOUNDERS, AND CONTRACTORS, &c.

JAMES AND KNOTT,  
DARLINGTON,

Are now in a position to SUPPLY their "SPECIAL" LUBRICATING OIL, PAINTS, PAINT OILS and VARNISHES of all kinds, TALLOW, SPUN TARNS, GREASE, COTTON WASTE, LEATHER BELTING, INDIA-RUBBER GOODS and STEAM PACKING, NAILS, BOLTS, RIVETS, VICES, &c., from stock, in large or small quantities, on receipt of orders.

Quotations given for new and secondhand machinery or stores, &c., on application to—  
JAMES AND KNOTT, COLLIERY AND ENGINEERS' STORES, DARLINGTON.

### SHUNTING.

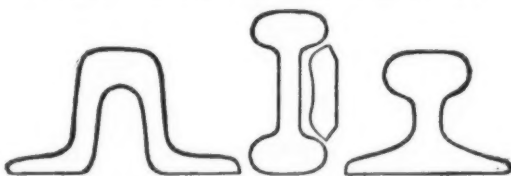
OVER 3000 OF THE RAILWAY TRUCK AND CARRIAGE SHUNTER now in use.

(HESHUYSEN'S PATENT.)

For particulars and Illustrated Price List apply to—

F. G. AND W. FRANCIS,  
RAILWAY SHUNTER FACTORY, FOLKESTONE.

JOHN BEATSON, DERBY.



IRON AND STEEL RAILS, of all sections, from 10 to 82 lbs. per yard, new, defective, or second-hand.

POINTS AND CROSSINGS, FISH PLATES, BOLTS, NUTS, CHAIRS, AND SPIKES. LOCOMOTIVE ENGINES AND MACHINERY.

MALLEABLE AND PIG-IRON OF ALL KINDS.

Delivered at all Ports and Railway Stations in Great Britain.

A SECONDHAND SIX-WHEELED TANK LOCOMOTIVE FOR SALE.

## H. WATSON,

HIGH BRIDGE WORKS,

NEWCASTLE-UPON-TYNE.

MANUFACTURER OF EVERY DESCRIPTION OF

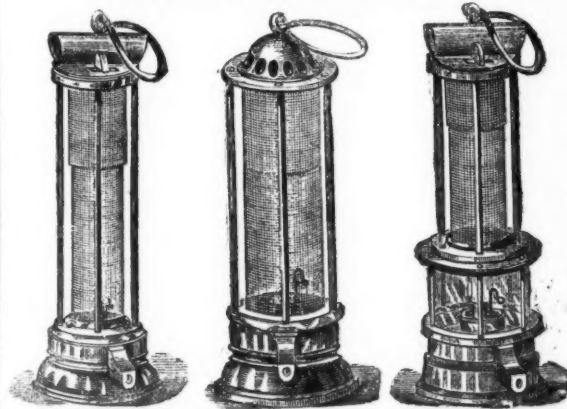
Engineering Fittings, Colliery Pump Working Barrels, Boiler Alarm Whistles, and Fire Engines.

IRON, COPPER, AND BRASS TUBING.

Gun Metal and Brass Castings of any size.

MALLEABLE BRONZE PRICKERS & BLASTING APPLIANCES.

### SAFETY-LAMPS.



1.—DAVY.

2.—STEPHENSON.

3.—CLANNY.

N.B.—The whole of these Lamps are made by workmen who have had great experience, and pass through a careful examination before being sent out. I also SUPPLY BRASS, COPPER, and COMPOSITION STEMMERS and PRICKERS, as embodied in the Mines Regulation Act, and made of such lengths best adapted for Mining purposes.

MR. W. F. STANLEY, MATHEMATICAL INSTRUMENT MANUFACTURER TO H.M.'S GOVERNMENT, COUNCIL OF INDIA, SCIENCE AND ART DEPARTMENT, ADMIRALTY, &c.

MATHEMATICAL, DRAWING, and SURVEYING INSTRUMENTS of every description, of the highest quality and finish, at the most moderate prices.

Price-list post free.

ENGINE DIVISION TO THE TRADE.

ADDRESS—GREAT TURNSTILE, HOLBORN, LONDON, W.C.



# BLAKE'S NEW PATENT STONE BREAKER.

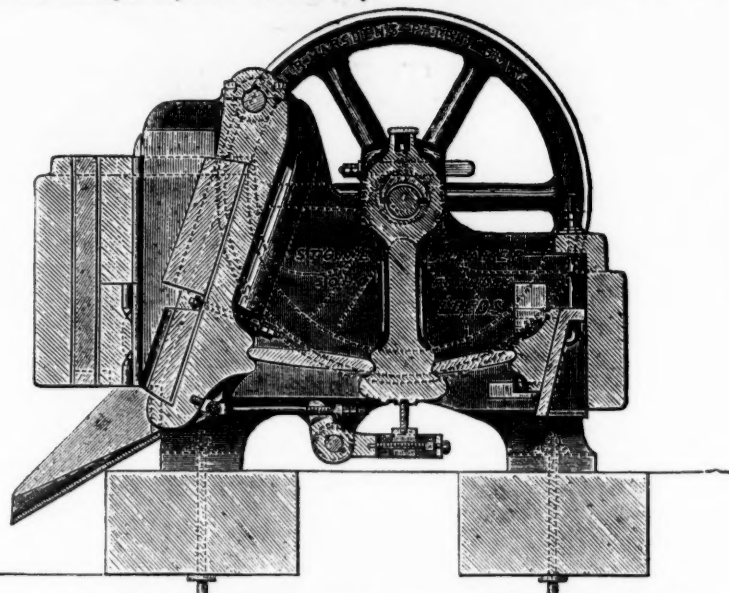
H. R. MARSDEN,

ORIGINAL PATENTEE, AND ONLY MAKER IN THE UNITED KINGDOM.—2000 IN USE.

These Machines are in extensive use amongst the Tin, Copper, Lead, and other Mines, and are showing a clear saving of 4d. and 6d. per ton over the ordinary mode of hand spalling, besides a diminution of stamping power equal to 30 per cent., which is a considerable saving. They are already well known to the mining world, and can be seen in operation at some of the leading Cornish and other Mines. For breaking the elvan rock they have established a decided supremacy over other Machinery.

Exclusively adopted by Her Majesty's Government, and by most Continental Governments.

Machines for Hand and Steam Power, specially designed and largely used for Crushing Pyrites, Limestone, Cement, Coal, Rocks, Ganister, &c., at all the principal works in the Kingdom.



Used by all the Great Mining Companies in the World, and are shown by Testimonials to effect a Saving of FIFTY per cent. over every other system.

Awarded 62 Gold and Silver Medals:—

Paris, 1867.  
Santiago, 1869.  
Leeds, 1875.  
Leicester, 1868.  
Cardiff, 1872.  
Bolton, 1872.  
Ayr, 1873-4-5-6, &c.

## EXTRACTS FROM TESTIMONIALS.

"They occupy an important position as labour-saving Machines."—*Architect.*

"The Machine is well designed, simple, but substantially made, and is capable of reducing any material to fine gravel, such as copper ore, and is certainly preferable to the stamps in use for that purpose."—*Mining Journal.*

"Your Machine will crush from 60 to 120 tons of hard limestone per day of 10 hours."

CATALOGUES, TESTIMONIALS, &c. (in the French or German language, if required), on application to the sole maker of "Blake's" Stone Breaker:—

H. R. MARSDEN, SOHO FOUNDRY, LEEDS, ENGLAND.

This illustration shows my new patent REVERSIBLE Cubing Jaws, which are made in upper and lower sections, and the backs planed, so that when the bottom part of the lower section becomes worn it can be turned upside down, and thus made equal to new. This process does not require the aid of skilled labour, the white metal being entirely dispensed with.

THESE JAWS WILL WEAR FOUR TIMES longer than any other, and they can be renewed at a fractional cost.

"No Machine is equal to yours, combining as it does very great power, simplicity of construction, and cheapness."  
"Mr. Marsden's Stone Breakers are so thoroughly well known and appreciated that it is unnecessary for us to describe their construction or speak of their merits."—*Engineering.*  
"By the use of your Machine we have reduced the cost of breaking and forming road material to one-half its previous cost."  
"Our 15 by 7 Machine has broken 4 tons of hard whinstone in 20 minutes for fine road metal, free from dust."

## The Barrow Rock Drill COMPANY

Are NOW PREPARED to SUPPLY their DRILLS, the ONLY ONES that have been SUCCESSFULLY WORKED in the MINES of CORNWALL. At DOLCOATH MINE, in the HARDEST known ROCK, a SINGLE MACHINE has, since its introduction in July, 1873, driven MORE THAN THREE TIMES the SPEED of HAND LABOUR, and at TWENTY PER CENT. LESS COST PER FATHOM.

In ordinary ends two machines may be worked together, and at a proportionately increased speed. They are strong, light, and simple, easily worked, and adapted for ends and stopes, and the sinking of winzes and shafts.

The company are also prepared to SUPPLY COMPRESSORS, and all necessary appliances for working the said Drills.

Apply to—

LOAM AND SON,  
LISKEARD, CORNWALL.



By a special method of preparation, this leather is made solid, perfectly close in texture, and impermeable to water; it has, therefore, all the qualifications essential for pump buckets, and is the most durable material of which they can be made. It may be had of all dealers in leather, and of—

I. AND T. HEPBURN AND SONS,  
TANNERS AND CURRIERS, LEATHER MILLBAND AND HOSE PIPE MANUFACTURERS,  
LONG LANE, SOUTHWARK, LONDON  
Prize Medals, 1851, 1855, 1862, for  
MILL BANDS, HOSE, AND LEATHER FOR MACHINERY PURPOSES.

Now ready, price 3s., by post 3s. 3d., Sixth Edition; Twentieth Thousand Copies much improved, and enlarged to nearly 300 pages.

HOPKINSON'S CONVERSATIONS ON MINES, between Father and Son. The additions to the work are near 80 pages of useful information, principally questions and answers, with a view to assist applicants intending to pass an examination as mine managers, together with tables, rules of measurement, and other information on the moving and propelling power of ventilation, a subject which has caused so much controversy.

The following few testimonials, out of hundreds in Mr. Hopkin's possession, speak to the value of the work:—

"The book cannot fail to be well received by all connected with collieries."—*Mining Journal.*

"Its contents are really valuable to the miners of this country."—*Miners Conference.*

"Such a work, well understood by miners, would do more to prevent colliery accidents than an army of inspectors."—*Colliery Guardian.*

London: MINING JOURNAL Office, 26, Fleet-street; and to be had of all book-sellers.

THE GREAT ADVERTISING MEDIUM FOR WALES.

THE SOUTH WALES EVENING TELEGRAM (DAILY), and SOUTH WALES GAZETTE (WEEKLY), established 1857.

The largest and most widely circulated papers in Monmouthshire and South Wales

CHIEF OFFICES—NEWPORT, MON.; and at CARDIFF.

The "Evening Telegram" is published daily, the first edition at Three P.M., the second edition at Five P.M. On Friday, the "Telegram" is combined with the South Wales Weekly Gazette, and advertisements ordered for not less than six consecutive insertions will be inserted at a uniform charge in both papers.

P.O.O. and cheques payable to Henry Russell Evans, 14, Commercial-street, Newport, Monmouthshire.

THE IRON AND COAL TRADES' REVIEW.

The IRON AND COAL TRADES' REVIEW is extensively circulated amongst the Iron Producers, Manufacturers, and Consumers, Coalowners, &c., in all the iron and coal districts. It is, therefore, one of the leading organs for advertising every description of Iron Manufactures, Machinery, New Inventions, and all matters relating to the Iron, Coal, Hardware, Engineering, and Metal Trades in general.

Office of the Review: 7, Westminster Chambers, S.W.

Remittances payable to W. T. Fringle.

## BRYDON AND DAVIDSON'S ROCK DRILL.

SELECTED BY THE BRITISH AND OTHER GOVERNMENTS.

Reduced prices of this Rock Drill (formerly called "Kainotomon"), Nos. 1 and 2, £32 and £34.

SUBJECT TO DISCOUNT.

## IMPROVED AIR COMPRESSORS.

Makers of Pumping and Winding Engines, Steam Hammers, Boilers, Pump Pipes, &c., &c. Castings of all kinds.

BRYDON AND DAVIDSON, ENGINEERS,  
WHITEHAVEN.

## THE ROANHEAD ROCK DRILL.

BY ROYAL LETTERS PATENT.

This justly-celebrated Rock Drill, the only one invented that will work in the hardest rock without more than the usual repairs required by any ordinary machinery, is now offered to the public.

It has been most successfully worked in the well-known Hematite Mines of Lancashire and Cumberland. Will drive 50 to 60 ft. in hard rock without change of drill, and can be worked by any miner, and kept in repair by any blacksmith. It is the most simple rock drill ever invented, and cannot with fair usage get out of order.

Plans, Estimates, including Compressors, and all other Mining Machinery, supplied on application to the sole makers,—

SALMON BARNES AND CO.,

MINING ENGINEERS.

Canal Head Foundry and Engineering Works, Ulverston.

J. WOOD ASTON AND CO., STOURBRIDGE

(WORKS AND OFFICES ADJOINING CRADLEY STATION),

Manufacturers of

CRANE, INCLINE, AND PIT CHAINS,

Also CHAIN CABLES, ANCHORS, and RIGGING CHAINS, IRON and STEEL SHOVELS, SPADES and FORKS, ANVILS, VICES, SCYTHES, HAY and CHAFF KNIVES, PICKS, HAMMERS, NAILS,

RAILWAY and MINING TOOLS, FRYING PANS, BOWLS, LADLES, &c., &c.

Crab Winches, Pulley and Snatch Blocks, Screw and Lifting Jacks, Ship Knees, Forgings, and Use Iron of all descriptions.

STOURBRIDGE FIRE BRICKS AND CLAY.

## BORING AND SINKING.

WILLIAM COULSON AND SON

Are prepared to UNDERTAKE BORINGS for MINERAL EXPLORATION, either from the SURFACE or UNDERGROUND WORKINGS; BORINGS for WATER SUPPLIES or TUNNEL SOUNDINGS, &c., at fixed prices, according to the size of bore-hole required; also to EXAMINE and REPORT upon the BEST MEANS to SECURE DEFECTIVE TUBING.

Plans and specifications prepared for Shaft Tubing, Wedging Cribbs, Pumping, and General Sinking Arrangements.

Address: W. COULSON AND SON, SHAMROCK HOUSE, DURHAM.